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The Standard of Appellate Review for Scientific Evidence: Beyond Joiner and Scheffer

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ARTICLES

The Standard of Appellate Review for Scientific Evidence: Beyond *Joiner* and *Scheffer*

*Randolph N. Jonakait**

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INTRODUCTION

In *General Electric Co. v. Joiner*,¹ the U.S. Supreme Court held that appellate courts must apply the abuse of discretion standard when reviewing lower court decisions to admit or exclude expert opinions under *Daubert v. Merrell Dow Pharmaceuticals, Inc.*² Under the abuse of discretion standard, an appellate court does not determine whether a particular trial court ruling was correct. Rather, the appellate court only decides whether the trial court's ruling was unreasonable or otherwise abusive.³ As a result, federal appellate courts generally do not have the power to rule categorically that any scientific evidence should or should not be admitted, except when admission or exclusion of such evidence would always be an abuse of discretion. Instead, scientific evidence may be admissible in one trial, while that same evidence might not be admissible in a similar, but different case.

Later last Term, in *United States v. Scheffer*,⁴ the Supreme Court upheld the constitutionality of Military Rule of Evidence 707, which categorically forbids polygraph evidence in court-martial proceedings.⁵ The *Scheffer* Court affirmed the rule-making author-

¹ 118 S. Ct. 512 (1997).

² See *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579 (1993); *Joiner*, 118 S. Ct. at 519; *Pierce v. Underwood*, 487 U.S. 552, 558 (1988) (stating that for standard of review purposes, "decisions by judges are traditionally divided into three categories, denominated questions of law (reviewable de novo), questions of fact (reviewable for clear error), and matters of discretion (reviewable for 'abuse of discretion')"); see also Cynthia K.Y. Lee, *A New "Sliding Scale of Deference" Approach to Abuse of Discretion: Appellate Review of District Court Departures Under the Federal Sentencing Guidelines*, 35 AM. CRIM. L. REV. 1, 11-12 (1997) (stating that lower courts often use categorical approach in deciding what standard of review to use). Lee noted that

[w]hile the Supreme Court has not created a comprehensive test for deciding what standard of review governs any given issue, lower courts often utilize a categorical approach under which questions of fact are reviewed under a clearly erroneous standard, questions of law are reviewed under a de novo standard, mixed questions of fact and law are reviewed under either a clearly erroneous or de novo standard depending upon the nature of the issue, and questions of trial court discretion are reviewed under an abuse of discretion standard.

Id. (footnotes omitted).

³ See *Western Elec. Co., Inc. v. Piezo Tech., Inc.*, 860 F.2d 428, 430-31 (Fed. Cir. 1988) (stating that abuse of discretion standard requires review of trial court's decision to determine whether it is clearly unreasonable).

⁴ 118 S. Ct. 1261 (1998).

⁵ See MILITARY R. EVID. 707(a) ("Notwithstanding any other provision of law, the results of a polygraph examination, the opinion of a polygraph examiner, or any reference to an offer to take, failure to take, or taking of a polygraph examination, shall not be admitted

ity's power to create broad, uniform evidentiary rules governing the admissibility of scientific evidence.

This broad power stands in sharp contrast to the limited power of federal appellate courts. Restricted to abuse of discretion review, federal appellate courts cannot similarly create such uniform evidentiary rules. Indeed, the *Scheffer* decision regarding lie detectors illustrates this point. In *Scheffer*, the Court indicated that both a decision to admit and to exclude polygraph evidence is reasonable and, therefore, not an abuse of discretion. Accordingly, federal appellate courts can no longer issue categorical rules regarding the admissibility of polygraph evidence.

The result of *Joiner* for polygraphs, as well as other types of scientific evidence, is that the same issue will be treated differently in different trials. Like cases will not be treated alike. The law will be less uniform and less predictable, causing an increase in the amount and complexity of litigation.

This seemingly undesirable result must be tolerated if the abuse of discretion review standard which produces it is truly the best standard for scientific evidence. *Joiner*, however, did not make such a policy choice. Rather, the Supreme Court simply concluded that previous judicial rulings compelled it to adopt abuse of discretion review.⁶ This standard, however, is not immutable. Just as the rule-making authority can promulgate a categorical rule about the admissibility of one form of scientific evidence, that authority can also change the standard of review for scientific evidence as a whole.

This Article examines whether the present standard of review for scientific evidence should change. Part I begins by examining *Joiner*'s adoption of abuse of discretion review for scientific evidence. Part II discusses the implications of reading *Joiner* together with *Scheffer*. Specifically, this Part illustrates how the abuse standard means that conflicting trial court decisions about particular forms of scientific evidence must be tolerated until the rule-making authority makes a categorical rule. Part III examines the reasons that generally support the abuse standard and demonstrates that many of these reasons do not support abuse of discretion review for scientific evidence. This Part goes on to suggest that more information is needed before the rule-making authority can make an informed policy choice. This Article concludes that the rule-

into evidence.").

⁶ See *Joiner*, 118 S. Ct. at 517.

making authority should collect the necessary information and consider changing the standard of review. With a less deferential standard, the law of scientific evidence can develop in a more uniform, predictable, and just manner.

I. GENERAL ELECTRIC CO. V. JOINER AND ABUSE OF DISCRETION REVIEW FOR SCIENTIFIC EVIDENCE

Precedent produced *Joiner*. Relying on modern and earlier judicial decisions, the Court, in an opinion by Chief Justice Rehnquist, first stated that "that abuse of discretion is the proper standard of review of a district court's evidentiary rulings."⁷ The admissibility

⁷ *Id.* *Joiner* noted,

Indeed, our cases on the subject go back as far as *Spring Co. v. Edgar*, 99 U.S. 645, 658 (1878), where we said that "cases arise where it is very much a matter of discretion with the court whether to receive or exclude the evidence; but the appellate court will not reverse in such a case, unless the ruling is manifestly erroneous."

Id. Edgar had won damages for personal injuries resulting from an attack in October by a buck deer kept on defendant's property. The defendant had sought reversal because of testimony from experts opining that male deer are especially dangerous in the fall during their rutting season. The Court noted that experts are excepted from the general rule that prohibits witness from giving opinions. The Court then stated, "It must appear, of course, that the witness is qualified to speak to the point of inquiry. . . . Whether a witness is shown to be qualified or not as an expert is a preliminary question to be determined in the first place by the [trial] court. . . ." *Spring Co.* 99 U.S. at 657-58. The Court then went on to state that this determination was one for the discretion of the trial court which could be reversed only if manifestly erroneous.

Joiner also cited the more modern cases of *Old Chief v. United States*, 117 S. Ct. 644 (1997), and *United States v. Abel*, 469 U.S. 45, 54 (1984). In *Old Chief*, interpreting Federal Rule of Evidence 403, the Court stated, "The standard of review applicable to the evidentiary rulings of the district court is abuse of discretion." *Old Chief*, 117 S. Ct. at 647 n.1. In *Abel*, which reviewed trial rulings about bias evidence, the Court stated, "A district court is accorded a wide discretion in determining the admissibility of evidence under the Federal Rules. . . . We hold there was no abuse of discretion. . . ." *Abel*, 469 U.S. at 54-55.

These are not the only times that the Supreme Court has applied the abuse of discretion standard to evidentiary decisions. See, e.g., *Beech Aircraft Corp. v. Rainey*, 488 U.S. 153, 172 (1988) ("The District Court's refusal to admit the proffered completion evidence was a clear abuse of discretion."); *Hamling v. United States*, 418 U.S. 87, 127 (1974) ("The District Court retains considerable latitude even with admittedly relevant evidence in rejecting that which is cumulative. . . . [T]he District Court's discretion was not abused.").

The Supreme Court, however, has not found every evidence decision to be a matter for trial court discretion. Sometimes the issue has been categorized as legal and subject to stricter review than for abuse of discretion. See Martin B. Louis, *Allocating Adjudicative Decision Making Authority Between Trial and Appellate Levels: A Unified View of the Scope of Review, the Judge/Jury Question, and Procedural Discretion*, 64 N.C. L. REV. 993, 1042 n.361 (1986) ("Questions classified as legal include the following: Whether evidence is protected by the work product and attorney-client privileges, *Upjohn v. United States*, 449 U.S. 383 (1981) [and] . . . whether evidence is hearsay or qualifies under an exception to the hearsay rules, *Mutual*

of scientific evidence is a trial court evidentiary ruling. Therefore, the admissibility of scientific evidence should be reviewed only for an abuse of discretion: "We hold . . . that abuse of discretion is the proper standard by which to review a district court's decision to admit or exclude scientific evidence."⁸

Life Ins. Co. v. Hillmon, 145 U.S. 285 (1892). . . .").

⁸ *Joiner*, 118 S. Ct. at 519. Joiner had contracted small cell lung cancer. He sued claiming that polychlorinated biphenyls ("PCBs") produced by the defendants had caused that cancer. The trial court ruled that Joiner's experts' opinions that PCBs had promoted the lung cancer were not admissible under *Daubert*. "[T]he court finds that Plaintiffs have failed to show by a preponderance of proof that their experts' opinions regarding the PCB/lung cancer link are admissible under the standards set out in [Federal] Rule [of Evidence] 702 and explicated in *Daubert*." *Joiner v. General Elec. Co.*, 864 F. Supp. 1310, 1327 (N.D. Ga. 1994). As a result, defendants won their summary judgment motion.

The Eleventh Circuit conceded that the abuse of discretion standard applied, but then seemed to indicate that when scientific evidence is excluded, a particularly strict form of that standard is required. "A district court's ruling on the admissibility of evidence is reviewed for abuse of discretion. . . . Because 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. General Elec. Co.*, 78 F.3d 524, 529 (11th Cir. 1996). The court then reversed, "Our review of the record indicates . . . that there appears to be a genuine factual dispute as to whether PCBs alone can cause cancer, and that this issue was inappropriate for summary judgment." *Id.* at 533.

The Supreme Court specifically rejected any notion that the review standard varied depending on whether scientific evidence was excluded. "A court of appeals applying 'abuse of discretion' review to such rulings may not categorically distinguish between rulings allowing expert testimony and rulings which disallow it." *Joiner*, 118 S. Ct. at 517. The situation does not change because the trial court's determination to exclude scientific evidence leads to a summary judgment against the proponent of the evidence. "On a motion for summary judgment, disputed issues of fact are resolved against the moving party. . . . But the question of admissibility of expert testimony is not such an issue of fact, and is reviewable under the abuse of discretion standard." *Id.*

The Supreme Court also rejected the contention that *Daubert* had changed this situation:

The Court of Appeals suggested that *Daubert* somehow altered this general rule [requiring the abuse of discretion standard for evidence rulings] in the context of a district court's decision to exclude scientific evidence. But *Daubert* did not address the standard of appellate review for evidentiary rulings at all. . . . [W]hile the Federal Rules of Evidence allow district courts to admit a somewhat broader range of scientific testimony than would have been admissible [before], they leave in place the "gatekeeper" role of the trial judge in screening such evidence.

Id.

Most appellate courts before *Joiner* had applied an abuse of discretion or manifestly erroneous standard of review to trial court determinations whether scientific evidence was admissible pursuant to *Daubert*. See G. Michael Fenner, *The Daubert Handbook: The Case, Its Essential Dilemma, and Its Progeny*, 29 CREIGHTON L. REV. 939, 1028 (1996) ("Though the words vary, the meaning is the same: almost all of the cases say the standard [of review] is broad or deferential, it is a clearly erroneous standard, it looks for a manifest or clear abuse of discretion."); Richard M. Bernstein, 'Daubert' Revisited: *The Proper Standard of Review*, 25 PRODUCT & SAFETY LIABILITY REP. 500, 502 (1997) (First, Second, Fifth, Sixth, and Seventh

While the Supreme Court has never truly defined what "abuse of discretion" means,⁹ some conclusions are evident. The abuse of discretion standard indicates that trial courts have discretion concerning the admission of scientific evidence. Discretion implies choice.¹⁰ As Professor Maurice Rosenberg explained, "To say that a court has discretion in a given area of law is to say that it is not bound to decide the question one way rather than another."¹¹ Accordingly, abuse of discretion requires appellate courts to allow different trial courts to reach different conclusions regarding the admissibility of a particular type of scientific evidence.¹²

Joiner seems to contemplate that courts will apply the abuse standard for scientific evidence the same way they do for evidence law generally.¹³ If so, appellate courts will be highly deferential to trial court rulings about scientific evidence. Appellate courts have seldom found trial court evidentiary rulings to be in error,¹⁴ and pre-

Circuits used manifestly erroneous standard; the Fourth, Eighth, Tenth, and District of Columbia Circuits used an abuse of discretion standard; the Ninth Circuit employed both formulations.).

In re Paoli Railroad Yard PCB Litigation, 35 F.3d 717 (3d Cir. 1994), cited by the Eleventh Circuit in *Joiner*, 78 F.3d at 529, was the most important decision employing a different standard. *Paoli* stated:

Although the review of the district court's fact findings that undergird its rulings on the admissibility of expert opinion is deferential, given the enormous power of the district court to foreclose submission of a party's case to the jury on the basis of a threshold determination of nonreliability of opinion evidence, we conclude that the review requires a "hard look" to insure that the district court's exercise of discretion was sound and that it correctly applied the several *Daubert* factors.

Paoli, 35 F.3d at 733.

⁹ See *Lee*, *supra* note 2, at 21. Lee noted that "[t]he Supreme Court has never provided a clear definition of abuse of discretion review. At times, the Court seems to equate abuse of discretion with the highly deferential clearly erroneous review. At other times, the Court has hinted at a less deferential definition of abuse of discretion." (footnotes omitted).

¹⁰ See Maurice Rosenberg, *Judicial Discretion of the Trial Court, Viewed from Above*, 22 SYRACUSE L. REV. 635, 636 (1971) (maintaining that "discretion conveys . . . the idea of choice").

¹¹ *Id.* at 636-37.

¹² See *General Elec. Co. v. Joiner*, Official U.S. Supreme Court Transcript, No. 96-188, 1997 WL 634566, at *6 (Oct. 14, 1997), where Chief Justice Rehnquist received an affirmative answer to his question: "When . . . you say abuse of discretion, as opposed to perhaps *de novo* review, . . . I take it that means that a . . . properly acting district court might have reached different . . . conclusions on the same evidence, and both would be affirmed on appeal?"

¹³ See *Joiner*, 118 S. Ct. at 517.

¹⁴ See Margaret A. Berger, *When, if Ever, Does Evidentiary Error Constitute Reversible Error?*, 25 LOY. L.A. L. REV. 893, 894-95 (1992). Although the federal courts were then trying about 20,000 cases a year, Berger only found thirty 1990 Court of Appeals decisions that stated in

sumably now appellate courts will seldom overrule trial rulings on the admissibility of scientific evidence.

Appellate courts, thus, have a limited role in deciding whether to admit or exclude scientific evidence. They can formulate the framework that trial judges must use to determine whether scientific evidence is admissible.¹⁵ That is what the *Daubert* Court did when it held that scientific evidence must "fit" the particular case and be the product of the scientific method to be admissible.¹⁶

officially reported opinions that the court was reversing because of evidentiary error, and she concluded that some of these reversals may really have been for reasons other than evidentiary error. *See id.* Professor Berger concluded that this survey "leaves the impression that evidentiary rules frequently matter relatively little in the case before the federal appellate court. . . ." *Id.* at 907.

Similarly, Eleanor Swift reviewed all the reported federal decisions concerning selected hearsay exceptions over several time periods and concluded:

[W]hether federal district courts admit or exclude the hearsay, appellate courts usually uphold the district courts' decision on appeal. . . . [T]wenty-six percent of the district courts' decisions were found erroneous but in only thirteen percent of the cases did the errors cause reversal. . . . [T]he impression is unmistakable that many federal appellate courts do not think it is their role to review district court admission and exclusion decisions carefully. The deferential "abuse of discretion" standard of review produces a low rate of trial court error.

Eleanor Swift, *The Hearsay Rule at Work: Has It Been Abolished De Facto by Judicial Decision?*, 76 MINN. L. REV. 473, 478-79 (1992) (citations omitted). David Leonard reviewed decisions of another portion of the evidence rules and reached a similar conclusion:

Appellate courts appear to conduct appallingly superficial review of trial courts' application of [Federal Rule of Evidence] 608(b). . . . [O]nce the appellate courts find that the evidence was offered pursuant to the "discretionary" part of rule 608(b), their analysis ceases. It is as though the trial court's action is simply not subject to review once the appellate court determines that the trial court applied the correct rule.

David P. Leonard, *Appellate Review of Evidentiary Rulings*, 70 N.C. L. REV. 1155, 1220, 1227 (1992); *see also* Victor J. Gold, *Do the Federal Rules of Evidence Matter?*, 25 LOY. L.A. L. REV. 909, 921 (1992) (noting that "where the language of the rule permits, appellate courts are inclined to justify the trial judge's decision on the grounds of discretion").

¹⁵ *See* Thomas M. Mengler, *The Theory of Discretion in the Federal Rules of Evidence*, 74 IOWA L. REV. 413, 427 (1989) (stating that "[u]niformly . . . the [trial] court's discretion [under the Federal Rules of Evidence] is guided"); *see also* Jon R. Waltz, *Judicial Discretion in the Admission of Evidence Under the Federal Rules of Evidence*, 79 NW. U. L. REV. 1097, 1103 (1984) (noting that "[g]uided discretion . . . identifies areas in which a judge has some flexibility and choice in decisionmaking but is restrained by more or less specific standards or guidelines to which he visibly must adhere").

¹⁶ *See* *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 591-92 (1993). The *Daubert* Court held that scientific evidence must "fit" the particular case in which it is proffered. *See id.* at 591. "[Federal Rule of Evidence] 702's 'helpfulness' standard requires a valid scientific connection to the pertinent inquiry as a precondition to admissibility." *Id.* at 591-92. Furthermore, the proffered evidence must be the product of a scientific method:

With that framework established, however, the appellate court's only job is to insure that the trial court has properly used the prescribed guidelines to reach its result.¹⁷

If that framework is employed, the appellate court must affirm the trial court's decision except in the rare instance when the trial court abuses its discretion in applying the guidelines. The appellate court, then, does not decide whether the scientific evidence should have been admitted. It does not reverse simply because it would have decided the issue differently from the trial court.¹⁸ It does not dictate how trial courts should decide future admissibility questions about similar kinds of evidence. Instead, the appellate

The subject of an expert's testimony must be "scientific . . . knowledge." The adjective "scientific" implies a grounding in the methods and procedures of science. Similarly, the word "knowledge" connotes more than subjective belief or unsupported speculation. . . . [I]n order to qualify as "scientific knowledge," an inference or assertion must be derived by the scientific method. Proposed testimony must be supported by appropriate validation — *i.e.*, "good grounds," based on what is known. In short, the requirement that an expert's testimony pertain to "scientific knowledge" establishes a standard of evidentiary reliability.

Id. at 589-90. To make this determination, a trial court must undertake a "flexible" inquiry into whether the proffer is of truly "scientific knowledge." *See id.* at 594. Many factors can influence the inquiry, but the trial court should consider whether the theory or technique "can be (and has been) tested [and] whether [it] has been subjected to peer review and publication." *Id.* at 593. The trial court should also consider "the known or potential rate of error . . . and the existence and maintenance of standards controlling the technique's operation" as well as the acceptance of the theory or technique in the relevant scientific community. *Id.* at 594.

¹⁷ *Cf. United States v. Taylor*, 487 U.S. 326, 334-35 (1988) (concluding that trial courts have "guided discretion" when determining whether to dismiss cases under Speedy Trial Act, 18 U.S.C.A. § 3161 *et seq.*, because statute gives factors to be considered in making dismissal decisions). The Court continued: "[A] district court must carefully consider those factors as applied to the particular case and, whatever its decision, clearly articulate their effect in order to permit meaningful appellate review." *Id.* at 336-37. The Court held: "The District Court failed to consider all the factors relevant to the choice of a remedy under the Act. What factors it did rely on were unsupported by factual findings or evidence in the record. We conclude that the District Court abused its discretion under the Act . . ." *Id.* at 344; *see also Koon v. United States*, 518 U.S. 81, 100 (1996) (stating that appellate courts must use abuse of discretion standard in reviewing trial court departures from United States Sentencing Guidelines, but also noting that "an abuse of discretion standard does not mean a mistake of law is beyond appellate correction. . . . A district court by definition abuses its discretion when it makes an error of law.") (citations omitted).

¹⁸ *Cf. Anderson v. City of Bessemer City*, 470 U.S. 564, 573 (1985) (noting that clearly erroneous review "standard . . . does not entitle a reviewing court to reverse the finding of the trier of fact simply because it is convinced that it would have decided the case differently"). Elsewhere, the Court has seemed to equate the clearly erroneous and abuse of discretion standards. *See Ornelas v. United States*, 517 U.S. 690, 695 n.3 (1996); *see also Leonard, supra* note 14, at 1189 n.187 (stating that clearly erroneous standard is equivalent to abuse of discretion standard).

court simply determines whether the trial court's choice was reasonable or permissible.¹⁹

When reasonable people could differ over whether the proffered scientific evidence satisfies the *Daubert* standard for admissibility, the appellate court must affirm a decision either to admit or exclude such evidence. When reasonable minds can differ, appellate courts cannot create a categorical rule about the admissibility of any particular scientific evidence no matter how wise it may be to have such uniformity.²⁰ Consequently, trial courts sitting in the same jurisdiction can reach opposite conclusions about the admissibility of a particular type of scientific evidence, and the appellate court must affirm those contrary results.

The rule-making authority, however, is not so limited. As *Scheffer* indicates, even when reasonable minds differ about the admissibility of scientific evidence, and federal appellate courts cannot create a categorical rule, the rule-making authority can.

II. THE RULE-MAKING AUTHORITY'S POWER

Edward Scheffer's proffer of the results of a polygraph examination in his drug-offense court-martial was precluded by Military Rule of Evidence 707, which makes polygraph evidence inadmissible in court-martials.²¹ The Supreme Court held that this provision did not abridge Scheffer's constitutional right to present a defense.

The Court noted that an accused's right to present evidence is subject to reasonable restrictions. Evidentiary "rulemakers have

¹⁹ Cf. *Louis*, *supra* note 7, at 999. *Louis* states:

On appeal [of an issue for trial court discretion], the question is not whether the trial level result is the better or best one but only whether it is a legally permissible one. Review, therefore, is limited to whether the applicable legal principles were identified and applied correctly and whether the findings of ultimate fact exceed the limits of reasonableness.

Id.

²⁰ Cf. David L. Faigman, *Appellate Review of Scientific Evidence Under Daubert and Joiner*, 48 HASTINGS L.J. 969, 978 (1997) (positing that "if scientific-factual disputes are removed from appellate scrutiny, contradictory results are sure to follow, but with no mechanism to cure them").

²¹ See *United States v. Scheffer*, 118 S. Ct. 1261, 1263 (1998). Scheffer was administered a polygraph test shortly after giving a required urine sample to the Air Force, but before the urinalysis results were known. See *id.* The polygraph test "indicated no deception" when he denied using drugs. See *id.* When his urine sample tested positive, Scheffer sought to introduce those polygraph results to bolster his claim that he had not knowingly used drugs. See *id.*

broad latitude under the Constitution to establish rules excluding evidence from trials. Such rules do not abridge an accused's right to present a defense so long as they are not 'arbitrary' or 'disproportionate to the purposes they are designed to serve.'²² Military Rule of Evidence 707 satisfies these requirements. The rule serves legitimate interests by "ensuring that only reliable evidence is introduced at trial, preserving the jury's role in determining credibility, and avoiding litigation that is collateral to the primary purpose of the trial."²³

The Court, however, also concluded that rational decision makers could disagree as to whether an absolute ban on polygraph evidence actually promotes reliable trials. The Court found that scientists and courts were "extremely polarized about the reliability of polygraph techniques. . . . This lack of scientific consensus is reflected in the disagreement among state and federal courts concerning both the admissibility and the reliability of polygraph evidence."²⁴ With opinions so divided, the rule-making authority can constitutionally create a rule categorically barring all polygraph evidence in criminal trials although a decision to admit such proof would not be unreasonable.

The approach taken by the President in adopting Rule 707 — excluding polygraph evidence in all military trials — is a rational and proportional means of advancing the legitimate interest in barring unreliable evidence. . . . Individual jurisdictions . . . may reasonably reach differing conclusions as to whether polygraph evidence should be admitted. We cannot say, then, that presented with such widespread uncertainty, the President acted arbitrarily or disproportionately in promulgating a per se rule excluding all polygraph evidence.²⁵

²² *Id.* at 1264 (citing *Rock v. Arkansas*, 483 U.S. 44, 56 (1987)).

²³ *Id.* at 1264-65.

²⁴ *Id.* at 1265.

²⁵ *Id.* at 1266; *see also* 10 U.S.C. § 836(a) (1994). The Uniform Code of Military Justice authorizes the President, as Commander in Chief of the Armed Forces, to promulgate evidentiary rules for the military courts:

Pretrial, trial, and post-trial procedures including modes of proof, . . . may be prescribed by the President by regulations which shall, so far as he considers practicable, apply the principles of law and the rules of evidence generally recognized in the trial of criminal cases in the United States district courts.

Id.; *Scheffer*, 118 S. Ct. at 1270. Justice Stevens, dissenting, suggested that the lower courts,

In essence, *Scheffer* held that the rule-making authority had not abused its discretion in adopting this rule about scientific evidence. The rule-making authority had the discretionary power to formulate rules of exclusion in order to promote the reliability of evidence introduced at trial.²⁶ Because rational decision makers could differ over whether polygraph tests are reliable, it was not an abuse of discretion for the rule maker to adopt an absolute prohibition on lie detector evidence.²⁷

before deciding whether Rule 707 violated the Constitution, should have first required "the parties to brief and argue the antecedent question whether Rule 707 violates Article 36(a) of the Uniform Code of Military Justice. . . . As presently advised, I am persuaded that the Rule does violate the statute and should be held invalid for that reason." *Id.* (Stevens, J., dissenting).

²⁶ As the *Scheffer* Court noted, citing Federal Rules of Evidence 702, 802, and 901: "State and federal governments unquestionably have a legitimate interest in ensuring that reliable evidence is presented to the trier of fact in a criminal trial. Indeed, the exclusion of unreliable evidence is a principal objective of many evidentiary rules." *Scheffer*, 118 S. Ct. at 1265.

²⁷ See *id.* The Court also held that *Rock v. Arkansas*, 483 U.S. 44 (1988), *Chambers v. Mississippi*, 410 U.S. 284 (1973), and *Washington v. Texas*, 388 U.S. 14 (1967), do not support the constitutional right to present polygraph evidence. These three cases found constitutional violations because evidence was excluded. Those exclusions, however, "significantly undermined fundamental elements of the accused's defense" by preventing the accused from relating her version of events or by preventing fact witnesses from testifying. See *Scheffer*, 118 S. Ct. at 1267-68. On the other hand,

Rule 707 does not implicate any significant interest of the accused. Here, the court members heard all of the relevant details of the charged offense from the perspective of the accused, and the Rule did not preclude him from introducing any factual evidence. Rather, respondent was barred merely from introducing expert opinion testimony to bolster his own credibility.

Id. at 1268-69 (footnotes omitted). In other portions of his opinion, in which only three other justices concurred, Justice Thomas also concluded that Rule 707 promotes the legitimate goal "of avoiding litigation over issues other than the guilt or innocence of the accused." *Id.* at 1267. This plurality further concluded that Rule 707 also serves the interest of "[p]reserving the jury's core function of making credibility determinations in criminal trials. . . . [J]urisdictions may legitimately determine that the aura of infallibility attending polygraph evidence can lead jurors to abandon their duty to assess credibility." *Id.* at 1266-67.

Justice Kennedy, in an opinion joined by Justice O'Connor, Justice Ginsburg, and Justice Breyer, concurred in the holding that Rule 707 did not violate the Constitution. See *id.* at 1269. Kennedy, however, disagreed with the conclusions about the jury's competence:

The continuing, good-faith disagreement among experts and courts on the subject of polygraph reliability counsels against our invalidating a per se exclusion of polygraph results. . . . With all respect, . . . it seems the principal opinion overreaches when it rests its holding on the additional ground that the jury's role in making credibility determinations is diminished when it hears polygraph evidence. I am in substantial agreement with Justice Stevens' observation that the argument demeans and mistakes the role and competence of jurors in deciding the factual question of guilt or innocence.

Certainly, if the rule-making authority can make categorical rules for a particular form of scientific evidence in criminal cases, that authority, which is ultimately Congress for the federal courts, can promulgate categorical rules for scientific evidence in all trials. When reasonable people can differ over whether a particular type of scientific evidence is reliable, Congress, but not appellate courts, can make policy choices and prescribe a rule of evidence.²⁸

On one level, *Joiner* and *Scheffer* read together should cast doubt on how polygraph evidence is treated in some federal courts. *Scheffer* noted that the Fifth and Ninth Circuits decided to leave the admissibility of lie detectors to the discretion of the trial courts,²⁹ the Fourth Circuit had recently reaffirmed its per se ban on polygraph evidence,³⁰ and the Second Circuit had "recently noted that it has 'not decided whether polygraphy has reached a sufficient state of reliability to be admissible.'"³¹ *Scheffer* listed the Fourth Circuit's

Id.

²⁸ See *Usery v. Turner Elkhorn Mining Co.*, 428 U.S. 1 (1976). In *Usery*, a provision of the Coal Mining Health and Safety Act of 1969 prohibited a denial of benefits for pneumoconiosis based solely on X-ray evidence. The Court concluded that this provision was constitutional: "It is sufficient that the evidence before Congress showed doubts about the reliability of negative X-ray evidence. That Congress ultimately determined 'to resolve doubts in favor of the disabled miner' does not render the enactment arbitrary under the standard of rationality appropriate to this legislation." *Id.* at 34; cf. Ronald J. Allen, *Montana v. Egelhoff — Reflections on the Limits of Legislative Imagination and Judicial Authority*, 87 J. CRIM. L. & CRIMINOLOGY 633, 652-53 (1997):

In our jurisprudence, the legislative power extends to the creation of rules of general applicability, the judicial to the decision in particular cases. If a legislature can specify the implications of particular pieces of evidence, this pragmatic distinction between legislatures and courts is considerably reduced, perhaps even eliminated. . . .

. . . Today, it is simply accepted that legislatures may prescribe rules of evidence for the courts . . . The Court has even approved the legislative prescribing of the effect of particular kinds of evidence. *Usery v. Turner Elkhorn Mining Co.* dealt with, among other things, a federal statute forbidding the denial of black lung benefits solely [on] the basis of an x-ray. Without any apparent recognition of the depth of the problem, the Court found this acceptable, commenting that of course Congress has plenary authority over rules of evidence.

²⁹ See *Scheffer*, 118 S. Ct. at 1266 (citing *United States v. Posado*, 57 F.3d 428, 434 (5th Cir. 1995) and *United States v. Cordoba*, 104 F.3d 225, 228 (9th Cir. 1997)); see also *United States v. Pulido*, 69 F.3d 192, 205 (7th Cir. 1995) (stating that polygraph admissibility is in trial court's discretion).

³⁰ See *United States v. Sanchez*, 118 F.3d 192, 197 (4th Cir. 1997); see also *United States v. Soundingsides*, 820 F.2d 1232, 1241 (10th Cir. 1987) (concluding per se ban on polygraph evidence).

³¹ *United States v. Messina*, 131 F.3d 36, 42 (2d Cir. 1997), quoted in *Scheffer*, 118 S. Ct. at 1266; cf. *United States v. Kwong*, 69 F.3d 663, 668 (2d Cir. 1995) (finding per se ban on

per se prohibition without comment, even though the Supreme Court had decided *Joiner* a few months earlier. *Scheffer*, however, indicates that both a decision to admit or exclude lie detector evidence is reasonable.³² Because neither a decision to admit nor a decision to exclude such evidence would be an abuse of discretion, federal appellate courts are required to affirm both decisions. Consequently, federal appellate courts such as the Fourth Circuit can no longer enforce a per se prohibition on polygraphs.³³

It is ironic, then, that *Scheffer* upholds a polygraph ban in military courts, for *Scheffer* and *Joiner* actually serve to open the door wider for polygraph evidence by lifting the previous per se ban in the federal courts. One federal trial court may now hear information about the reliability of polygraphs and exclude the evidence with a conviction resulting. Next door, perhaps, another judge may hear the same data about reliability and admit the evidence with an acquittal following. Furthermore, each time such evidence is proffered, the litigants and the court will have to spend the time and resources exploring the reliability of that scientific evidence. Even if such disparate, time-consuming treatment of the same evidence seems unjust or unwise, the appellate courts are powerless to im-

polygraph evidence).

The Supreme Court could also have added that the Sixth, Eighth, and Eleventh Circuits have stated polygraph evidence can be admitted if stipulated to by both parties before the test is administered. See, e.g., *United States v. Sherlin*, 67 F.3d 1208, 1217 (6th Cir. 1995); *United States v. Scarborough*, 43 F.3d 1021, (6th Cir. 1994); *United States v. Anderson* 788 F.2d 517, 519 n.1 (8th Cir. 1986); *United States v. Piccinonna*, 885 F.2d 1529 (11th Cir. 1989), *aff'd*, 925 F.2d 1474 (11th Cir. 1991).

³² See *Scheffer*, 118 S. Ct. at 1267-68.

³³ Nor can a per se polygraph prohibition be based on the concern that juries will not be able to properly evaluate lie detector evidence. A majority of the *Scheffer* Court rejected that basis for regulating that evidence. See *id.* Furthermore, a concern about a jury's inability to evaluate polygraph evidence should be weighed under Federal Rule of Evidence 403. The Federal Rule of Evidence 403 provides: "Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence." FED. R. EVID. 403. Rule 403 trial decisions, like other evidence decisions, must be reviewed by an appellate court using an abuse of discretion standard. See 2 JACK B. WEINSTEIN & MARGARET A. BERGER, WEINSTEIN'S FEDERAL EVIDENCE, § 403.02[2][d] (Joseph M. McLaughlin ed., Mathew Bender 2d ed. 1997). As long as it is not an abuse of discretion for a trial court to conclude that a jury's difficulties in evaluating lie detector evidence are not substantially outweighed by the test's probative value, an appellate court cannot reverse that ruling.

Because *Scheffer* states that it is reasonable for different jurisdictions to come to different conclusions on the admissibility of polygraph tests, it must be reasonable for trial courts to come to different conclusions about how Rule 403 should affect such evidence. See *Scheffer*, 118 S. Ct. at 1266. Under these circumstances, an appellate court cannot make a per se prohibition based on its concerns about the jury's ability to evaluate the evidence.

pose a uniform approach. Such uniformity can only be imposed by the rule-making authority.

The point here is not to examine how polygraph evidence should be treated, but to examine whether the process for declaring general rules about particular scientific evidence whose reliability is reasonably debatable should be lodged entirely outside the judiciary. With the power placed solely with the rule-making authority, contrary treatment of the same or similar scientific evidence with debatable reliability, be it lie detectors, the causal link between polychlorinated biphenyls ("PCBs") and lung cancer, or any other scientific evidence, should be common. Experience indicates that the rule-making authority will seldom promulgate rules about specific scientific evidence. We do not now have many such dictates, and nothing indicates that the pace of such congressional rule-making will change dramatically.

As a result, only a small subset of scientific evidence will receive uniform treatment. Moreover, because the ultimate rule-making authority for the federal courts is Congress, only the kind of scientific evidence that garners sufficient political attention and support will be governed by uniform rules. It is unlikely that the political process will recognize and address all of the many forms of scientific evidence that could benefit from uniform treatment. Furthermore, although the legislative process will not necessarily produce poor rules,³⁴ such rules will be adopted without the benefit of appellate decisions that evidence codifiers often have.³⁵ Normally, thorough consideration by appellate courts of the merits of an evidence rule guarantees that the ramifications of a rule have been

³⁴ See Eleanor Swift, *Does It Matter Who Is in Charge of Evidence Law?*, 25 LOY. L.A. L. REV. 649, 665, 668 (1992). Swift stated:

The legislative process . . . directs considered attention to conflicts in interests and values when evidence codes are enacted and changed. Proposals are addressed by a wide variety of participants, including both legislators and interest groups. . . .

And while the legislature is not always thought of as a repository of moral wisdom, its deliberative processes include inputs on moral questions far broader than common law adjudication.

³⁵ Cf. *id.* at 660 (arguing that political initiatives do not consider ramifications of passage on evidence law). Swift maintained that "[t]raditionally, adjudication and legislation have been the legal mechanisms by which value conflicts related to the proof process in . . . trials have been resolved. Evidence law, first judge-made and then codified, is the result." *Id.*

explored.³⁶ After *Joiner*, however, appellate decisions will no longer analyze the merits of the admissibility of scientific evidence. Rather, appellate courts will only analyze whether the trial court abused its discretion. Without the benefit of that appellate analysis, codifiers' choices may not be well considered.

Although Congress does have the power to make rules for particular forms of scientific evidence, there is also a second option. Not only can the rule-making authority promulgate dictates for particular kinds of scientific evidence, it can also grant appellate courts a similar power by changing the standard of review. Abuse of discretion review is not written in stone. It is not even written into the Federal Rules of Evidence.³⁷ It is a judicially imposed standard, and the rule-making authority can change it. If Congress dictates an appellate review standard for scientific evidence, the courts must follow it.³⁸

Joiner itself only concluded that precedent compelled the abuse of discretion standard for scientific evidence. *Joiner* did not analyze the merits of that standard for scientific evidence. An examination of the virtues of abuse of discretion review for scientific evidence is needed. The starting point of this examination is an exploration

³⁶ See *id.* at 665, 670. Swift noted:

[W]hen evidence law is developed through adjudication, the adversary system usually insures that careful, considered attention is paid to important changes in the law. Such changes are formulated by judges on the basis of competing doctrinal solutions to problems of proof presented by adversaries. The judge's decision is case-specific. The judge focuses on the likely concrete effects of the evidence change he or she is being asked to make. The adversaries present specific arguments about benefits and costs to the particular parties, and they may also present generalized arguments as to the possible broad or long-term effects on other cases to illuminate the policy choices that are at stake. . . .

.....
Judge-made rules develop incrementally, on a case-by-case basis. They are subject to critique by the parties on appeal and by parties arguing the next case. They are subject to revision by other judges throughout the legal system. One-sidedness cannot dominate this process. . . .

Id.

³⁷ See FED. R. EVID. 103 (stating that evidentiary ruling cannot be considered "error . . . unless a substantial right of the party is affected" and which error, unless it is "plain error," has been properly preserved by objection or offer of proof). Other than this general statement, Congress has neither enacted an appellate review standard specifically for scientific evidence nor for evidence rulings generally.

³⁸ Cf. Michael Edmund O'Neill, Note, *A Two-Pronged Standard of Appellate Review for Pretrial Bail Determinations*, 99 YALE L.J. 885, 895 (1990) (stating that most crucial factor for determining appellate review is congressional authorization). O'Neill stated: "[C]ourts are obligated to apply review standards enacted by Congress." *Id.*

of the reasons traditionally given to support abuse of discretion review.

III. REASONS FOR ABUSE OF DISCRETION REVIEW

The Supreme Court has never comprehensively articulated the policies that support abuse of discretion review.³⁹ In *Koon v. United States*,⁴⁰ however, the Court indicated several reasons for imposing the abuse standard. *Koon* held that abuse of discretion review should be used by appellate courts in reviewing trial court departures from the Federal Sentencing Guidelines. The Court came to this conclusion because of congressional intent,⁴¹ because of the tradition of broad trial court discretion in sentencing,⁴² because trial courts are more institutionally competent than appellate courts to make such decisions,⁴³ and because sentencing guideline departures often depend on unique, case-specific factors that are little susceptible to general rules pronounced by appellate courts.⁴⁴

³⁹ See *id.* (noting that "[n]o single, precise rule exists to guide an appellate court in choosing a standard with which to review lower court decisions; both precedent and legal tradition, however, recognize several factors appellate courts should consider in determining the appropriate scope of review"); see also Michael R. Bosse, *Standards of Review: The Meaning of Words*, 49 ME. L. REV. 367, 370-71 (1997) (stating that "[s]tandards of review are widely understood to be based on whether the issue 'is' one of 'fact' or 'law.' . . . The labels 'fact' and 'law' are attached to issues only after the policies underlying substantive law have influenced the appellate court to apply one standard of review or another.").

⁴⁰ 518 U.S. 81 (1996).

⁴¹ See *id.* at 97-98. The Court stated:

Congress was concerned about sentencing disparities, but we are just as convinced that Congress did not intend, by establishing limited appellate review, to vest in appellate courts wide-ranging authority over district court sentencing decisions. Indeed, the text of [18 U.S.C.] § 3742 manifests an intent that district courts retain much of their traditional sentencing discretion. . . .

. . . .
 . . . Congress directed courts of appeals to "give due deference to the district court's application of the guidelines to the facts." 18 U.S.C. § 3742(c)(4).

Id.

⁴² See *id.* at 98 (stating that "[a] district court's decision to depart from the Guidelines . . . will in most cases be due substantial deference, for it embodies the traditional exercise of discretion by a sentencing court").

⁴³ See *id.* (noting that "[d]istrict courts have an institutional advantage over appellate courts in making these sorts of determinations").

⁴⁴ See *Cooter & Gell v. Harmax Corp.*, 496 U.S. 384, 404 (1990) quoted in *Koon v. United States*, 518 U.S. 81, 99 (1996). The *Cooter* Court stated that the departure decision involves "the consideration of unique factors that are 'little susceptible . . . of useful generalization,'" and as a result, de novo review is "unlikely to establish clear guidelines for lower courts." *Id.*

Professor Maurice Rosenberg, in his influential article, gives similar reasons as to why broad discretion is typically granted to trial courts.⁴⁵ Rosenberg also adds that abuse of discretion review is supported by the desire to economize on judicial resources, to maintain trial court morale, and to promote finality.⁴⁶

The issue of congressional intent, although relevant in *Koon*, is not relevant for a determination of what review standard the rule-making authority should set for scientific evidence. With that exception, the other rationales suggested by both Rosenberg and the Court should be explored to determine whether the policy goals they serve are accomplished by applying abuse of discretion review to scientific evidence. Section A of this Part will begin by exploring Rosenberg's trio of policies — economy, trial court morale, and finality. Sections B through D of this Part examine the applicable policies that support abuse of discretion review as articulated by the Supreme Court in *Koon*. Finally, Section E discusses the related question of whether the novelty of scientific evidence itself should be considered in evaluating which standard of review is most appropriate.

A. *Morale Uplift, Economy, and Finality*

Professor Rosenberg concludes that the grounds he summarizes as morale uplift, economy, and finality are not substantial reasons for deciding to grant broad appellate deference to the trial court. These reasons say little about which trial rulings should receive deference.⁴⁷ For example, with respect to trial court morale, Rosenberg stated:

A trial judge might become dispirited if he had the sense that every rapid-fire ruling he makes at trial is to be fully reviewable by a clutch of appellate judges who can study, reflect, hear and read

at 404-05; cf. Lee, *supra* note 2, at 29-30 (noting that "[t]he *Koon* Court relied upon three rationales to support its holding that appellate courts should review district court departure decisions for abuse of discretion: congressional intent, institutional competence, and the unique nature of the departure decision").

⁴⁵ See Rosenberg, *supra* note 10, at 660-65 (noting five reasons supporting abuse of discretion standard).

⁴⁶ See *id.* at 660-63.

⁴⁷ See *id.* at 662 (stating that "[t]he common vice of the first three reasons — economy, morale uplift, and finality — is their failure to provide clear clues as to which trial court rulings are cloaked with discretionary immunity of some strength, and which are not").

carefully assembled arguments, consult their law clerks, debate among themselves and, after close analysis, overturn his ruling.⁴⁸

Rosenberg, however, then adds: "That reason, worthy and compassionate as it is, . . . falls short of telling which of the rapid-fire trial rulings are to be immune from review and which not."⁴⁹

Rosenberg similarly concludes that the desire to economize on judicial resources does not indicate which trial court rulings should receive abuse of discretion review. The review standard for scientific evidence, however, does have a distinctive effect on judicial economy. Deference to trial court rulings on scientific evidence, as with other evidentiary rulings, does economize on appellate judicial energies, but not as much as deference to other trial rulings.⁵⁰

Judicial economy for the appellate court weighs heaviest when, if deference were not granted to the trial court, the appellate court would have to review an entire record to make its determination.⁵¹

⁴⁸ *Id.* at 661.

⁴⁹ *Id.*; see also Mengler, *supra* note 15, at 414 (positing that Federal Rules of Evidence are flexible partly because "the drafters believed that evidence, arguably more than any other field of the law, calls for trial judges to make quick decisions"); cf. Kelly Kunsch, *Standard of Review (State and Federal): A Primer*, 18 SEATTLE U. L. REV. 11, 20 (1994) (arguing erosion of public confidence in trial courts is better rationale to defer to decisions than judges' dislike of reversals); Louis, *supra* note 7, at 1015 (stating that "[t]rial judges whose decisions are subject to free appellate review are not known to suffer morale problems and are not regarded as second class citizens").

⁵⁰ See Rosenberg, *supra* note 10, at 660 (stating that "[a]ppeal courts would be swamped to the point of capsizing if every ruling by a trial judge could be presented for appellate review"); see also Kunsch, *supra* note 49, at 20 (noting "reason given [for deference to trial courts] is a reduction of court congestion. If fewer parties appeal, there will be fewer appellate cases."); Louis, *supra* note 7, at 998 (asserting that "[c]rowded appellate dockets and the temporal inability of appellate courts to immerse themselves in the record of every case have necessitated deference to most trial level determinations having a substantial factual component"); cf. Edward H. Cooper, *Civil Rule 52(a): Rationing and Rationalizing the Resources of Appellate Review*, 63 NOTRE DAME L. REV. 645, 651 (1988). Cooper stated:

Mere reduction in the number of appeals does not have any obvious intrinsic virtue. Appellate courts should be responsible for deciding cases as well as possible, and should not narrow the standard of review simply to avoid the responsibility of decision. Nonetheless, if we cannot or will not increase appellate capacity to the point needed to employ the best standard of review, it may be wise to serve the interests of all litigants by adopting standards of review that help sift out all but the more extreme claims of error.

Id.

⁵¹ See Michael A. Annis, Note, *Civil Procedure: Cooter & Gell v. Hartmarx Corp.: An Analysis of Rule 11 and Its Appropriate Standard of Review*, 44 OKLA. L. REV. 495 (1991). Annis maintained that "reviewing de novo a fact-specific legal conclusion is extremely time consuming for appellate courts. The federal courts simply do not have the resources to spend

As Justice Scalia stated in *Pierce v. Underwood*:⁵²

[E]ven where the district judge's full knowledge of the factual setting can be acquired by the appellate court, that acquisition will often come at unusual expense, requiring the court to undertake the unaccustomed task of reviewing the entire record, not just to determine whether there existed the usual minimum support for the merits determination made by the factfinder below, but to determine whether urging of the opposite merits determination was substantially justified.⁵³

Independent review of scientific evidence would not place that heavy burden on appellate judges. It would require that appellate judges master all the materials of a *Daubert* hearing. Because *Daubert* hearings often contain complex and unfamiliar information, mastery could be time-consuming.⁵⁴ The appellate court, however, need only review this fraction of an entire trial record. Thus, abuse of discretion review of scientific evidence will not save as many appellate resources as it does for review of a fact found after trial.⁵⁵

Unlike other evidentiary rulings, however, abuse of discretion review of scientific evidence determinations may significantly drain the resources of both trial courts and litigants. Without a uniform rule about particular kinds of scientific evidence, litigants will be entitled to a trial-level *Daubert* hearing each time such evidence is

time researching facts that have previously been decided. Judicial economy remains a valid interest of the federal court system." *Id.* at 510 (footnote omitted).

⁵² 487 U.S. 552 (1988) (holding that review of trial court's determination that Equal Access to Justice Act, 28 U.S.C. § 2412(d), substantially justified party's position is abuse of discretion).

⁵³ *Id.* at 560.

⁵⁴ See Fenner, *supra* note 8, at 1031. Fenner stated:

It is not just a matter of training or inclination, it is also a matter of time and resources. . . . The time pressures on the best of our judges means that they may not "have the time to spend at trial or beforehand to make fully considered independent decisions on validity."

Id. (quoting CHRISTOPHER B. MUELLER & LAIRD C. KIRKPATRICK, MODERN EVIDENCE § 7.8, at 991 (1995)).

⁵⁵ Cf. Louis, *supra* note 7, at 1038 (referring to both procedural and evidentiary questions as "procedural"). Louis stated: "The number of pages in the record relevant to procedural rulings also should ordinarily be fewer than those relevant to determinations going to the merits. Hence, the time required for free review of procedural questions will not ordinarily be as great as for substantive ones." *Id.* at 1040.

offered.⁵⁶ For example, without a per se rule on polygraphs, each time a party seeks to offer a lie detector test into evidence, if the opponent objects, the trial court will have to hold a hearing. Of course, trial courts have to make many evidentiary rulings, but most such rulings use relatively few trial court resources.⁵⁷ It generally takes little effort to determine whether evidence is hearsay or even forbidden character evidence. Abuse of discretion review of these rulings saves appellate resources by reducing the number and complexity of appeals. Because such trial evidentiary determinations require few resources, the overall scheme — many inexpensive trial rulings, but few appeals — may best promote judicial economy.

The balance, however, is different for scientific evidence. *Daubert* hearings can require the gathering of both experts and literature and the mastering of often difficult material.⁵⁸ As a result, such hearings can be costly in time and money. Abuse of discretion review, with its lack of general pronouncements about particular scientific evidence, may save some appellate resources, but at the cost of otherwise unnecessary, costly trial court hearings. Consequently, abuse of discretion review for scientific evidence may actually increase the overall drain on judicial resources.

Scientific evidence also intersects with Rosenberg's finality concern differently from other evidentiary areas. One goal of finality is to have both the litigants and society acquiesce in the outcome of a trial as soon as possible. As Professor Rosenberg explains, "The more reverse-proof the trial judge's rulings, the less likely the losing attorney is to test them on appeal and the sooner the first adjudication becomes accepted and the dispute tranquilized."⁵⁹

This theory of finality holds true for most trial court evidentiary

⁵⁶ See Fenner, *supra* note 8, at 967 (stating "[w]here *Daubert* testing applies, it is mandatory, and the expert evidence cannot be admitted without it").

⁵⁷ See *id.* at 968 (noting reasons why mandatory evidentiary hearings may not be burdensome).

⁵⁸ See *id.* at 1031 (emphasizing complexity of cases involving scientific evidence).

⁵⁹ Rosenberg, *supra* note 10, at 661. Rosenberg added,

Except where restrained by the final judgment principle, the party with the deeper pocket might try to wear down his adversary by challenging every uncongenial ruling, whether made in the pleading, discovery, trial or post-trial phases of the litigation. Conferring near-finality on trial court orders by restrictive review practices dampens the possibility of that sort of abuse.

rulings because the appellate court seldom will have information that would help it to resolve the issue better than the trial court. If a trial court excludes evidence as too prejudicial under Federal Rule of Evidence 403, or admits hearsay that falls within the excited utterance exception, normally new facts will not develop after the trial that might put that ruling in a different light and strengthen the losing litigant's belief that an injustice has been done. Because the losing litigant is generally just hoping for an opposite evidentiary interpretation, it is fair and sensible to encourage the parties to accept the first adjudication.

With scientific evidence, however, additional information is often likely to develop after the trial that may cast doubt on the initial ruling. When scientific evidence is debatable and a trial court would not abuse its discretion by either admitting or excluding that evidence, the science itself will often be the object of continuing study or interpretation. While an appeal is pending, new scientific information can develop. An appeals court, however, should not consider this new data when reviewing a *Daubert* ruling because the abuse standard limits review to the trial court record. As the Sixth Circuit stated:

[I]f we were to look at new scientific data available to us but not available to the district court that made the admissibility determination, we would not be confining ourselves to reviewing the district court's admissibility ruling, but would be making a *de novo* determination based on post-conviction developments or articles.

...[W]e find that the key is whether the testimony met the requirements of Federal Rule of Evidence 702 at the time of the district court's admissibility determination, not whether subsequent events provide evidence that contradicts or calls into question the district court's view at the time of its admissibility ruling.⁶⁰

⁶⁰ United States v. Bonds, 12 F.3d 540, 553 (6th Cir. 1993). The trial court in *Bonds* admitted DNA typing. See *id.* at 551. Nearly two years after the hearing on the scientific evidence and more than a year after the convictions, but eight months before the appeal was argued and 20 months before the appellate decision, the National Research Committee of the National Academy of Sciences issued a report on DNA typing. See *id.* at 551-52. The defendants relied heavily on that report in arguing for a reversal, but the Sixth Circuit said it could not be considered on appeal. See *id.* at 552.

On the other hand, when new information that supports the losing litigant is available, but the appellate court must turn a blind eye to it, both the losing party and society are likely to find the resulting ruling unacceptable — it will look as if justice has been sacrificed to artificial procedure. Under these circumstances, the abuse standard is unlikely to tranquilize disputes and produce finality. It, instead, may only fuel mistrust of the courts.

Scientific evidence rulings also raise another concern with respect to finality. Abuse of discretion review tends to end the particular litigation at the trial stage without producing precedent that will guide other courts in future cases. Consequently, a prospective litigant will have little way of knowing whether her debatable scientific evidence will be admissible. This uncertainty will lead to more suits than if precedent had indicated that the evidence was inadmissible. Similarly, when a litigant brings a lawsuit that hinges upon the admissibility of such evidence, the uncertainty surrounding admissibility will make it harder for the litigants to assess what terms, if any, are appropriate for settlement. Without meaningful precedent, there might be more litigation and more protracted litigation in the future. As commentators have stated, "If parties know clearly in advance what each side could prove were litigation to become necessary, nine times out of ten there will be no need for litigation — everyone will act according to the expected result."⁶¹ If appellate review of scientific evidence could lead to useful precedents, providing future litigants some measure of predictability for decisions regarding scientific evidence, this factor should be considered in selecting a review standard.⁶²

B. Tradition

Koon, in granting deference to trial courts for sentencing guidelines departures, also relied on the fact that trial courts traditionally had discretion in sentencing.⁶³ Of course, if the rule-making authority prescribes a standard of review for scientific evidence, it should hardly be bound by how such evidence has been treated in the past. In fact, however, tradition actually says little about how now to approach scientific evidence because *Daubert* itself is an im-

⁶¹ PAUL F. ROTHSTEIN ET AL., EVIDENCE: CASES, MATERIALS, AND PROBLEMS 1 (2d ed. 1998).

⁶² See *infra* notes 130-46 and accompanying text.

⁶³ See *Koon v. United States*, 518 U.S. 81, 97-99 (1996).

portant break from historical practice.

Before *Daubert*, courts employed a dual-level approach to determine the admissibility of scientific evidence. Novel scientific evidence was subjected to special scrutiny,⁶⁴ while other expertise was admitted with little examination. Courts seldom analyzed whether an expert's opinion was based on "good grounds," as *Daubert* requires.⁶⁵ Instead, judges generally only demanded that a proffered expert witness have appropriate qualifications. If the witness possessed the necessary credentials to be qualified as an expert, the testimony was allowed as long as it was relevant. In practice, because courts usually determined that experts were appropriately qualified,⁶⁶ courts undertook little screening of the proffered expertise.⁶⁷

Indeed, *Spring Co. v. Edgar*,⁶⁸ which *Joiner* cited for the ancient roots of the abuse of discretion standard for evidentiary rulings, illustrates this traditional approach to expertise.⁶⁹ At issue in *Spring Co.* were the credentials of an expert. The Court concluded, "Whether a witness is shown to be qualified or not as an expert is a

⁶⁴ See *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 592 n.11 (1993). *Daubert*, however, has ended the traditional distinction between novel and non-novel science: "Although the *Frye* decision itself focused exclusively on 'novel' scientific techniques, we do not read the requirements of Rule 702 to apply specially or exclusively to unconventional evidence." *Id.*

⁶⁵ See *id.* at 590.

⁶⁶ See Samuel R. Gross, *Expert Evidence*, 1991 WIS. L. REV. 1113, 1158 (asserting that "if it appears that the witness has at least the minimal qualifications for an expert in the field in which she is offered, she will usually be permitted to [testify]"); Anthony Champagne, Daniel W. Shuman, & Elizabeth Whitaker, *An Empirical Examination of the Use of Expert Witnesses in American Courts*, 31 JURIMETRICS J. 375, 390 (1991) (arguing "[i]n jury trials, if it is a close question whether an expert is qualified to testify, 80% of the judges were inclined to let the jury hear the testimony"); see also Christopher P. Murphy, *Experts, Liars, and Guns for Hire: A Different Perspective on the Qualification of Technical Expert Witnesses*, 69 IND. L.J. 637, 654 (1994) (noting that "qualification of an expert is within the broad discretion of the trial judge; appellate courts will not disturb such discretion unless the ruling is manifestly erroneous").

⁶⁷ See Paul C. Giannelli, *Daubert: Interpreting the Federal Rules of Evidence*, 15 CARDOZO L. REV. 1999, 2010-11 (1994). Giannelli stated that "the qualification of the expert presumptively qualifies the technique. This formulation of the relevancy approach makes the trial court too dependent on the testifying expert. Unfortunately, experience shows that qualified witnesses do testify to questionable conclusions." *Id.*; cf. David L. Faigman, *To Have and Have Not: Assessing the Value of Social Science to the Law as Science and Policy*, 38 EMORY L.J. 1005, 1012 (1989) (asserting that "[t]his practice results in the presumptive admissibility of the testimony of any accredited expert whose testimony is otherwise relevant. . . . The usual response, and in fact the law's apparent course, has been to trust certain professional fields to decide which findings can be of assistance.").

⁶⁸ 99 U.S. 645 (1878).

⁶⁹ See *General Elec. Co. v. Joiner*, 118 S. Ct. 512, 517 (1997). The *Joiner* Court cited *Spring* for the ancient roots of the abuse of discretion standard for evidentiary rulings. See *id.*

preliminary question to be determined in the first place by the [trial] court; . . . the appellate court will not reverse in such a case, unless the ruling is manifestly erroneous."⁷⁰ The "good grounds" for the expertise, however, were never examined.⁷¹

Daubert, however, requires more than an examination of the credentials of the proffered scientific expert. Trial courts are now instructed to analyze the scientific expertise itself before the evidence is admissible. With this requirement,⁷² the historical approach to experts and their scientific opinions was broken.

C. Institutional Competency

While Rosenberg labeled economy and finality "not particularly impressive or substantial" reasons for granting appellate deference to the trial court, he thought that the remaining two rationales made good sense for the division of judicial responsibilities.⁷³ In setting review standards, a rule-making authority ought to give great weight to whether trial courts are more competent than appellate courts to make the determination and whether the trial court's decision depends on the kind of factors that are little susceptible to general rules pronounced by appellate courts.⁷⁴

For scientific evidence, the crucial issue of institutional competency blurs into whether appellate court review will lead to the pronouncement of useful, general rules.⁷⁵ Trial courts can be in a

⁷⁰ *Spring Co.*, 99 U.S. at 658.

⁷¹ Indeed, by today's standards, the expert evidence in *Spring Co.* probably should not have been admitted. The *Spring Co.* Court concluded that even if the witnesses were "not properly to be regarded as experts, the court is of the opinion that the testimony was properly admitted as a matter of common knowledge." *Id.* at 658.

⁷² See Fenner, *supra* note 8, at 966-67. Fenner noted that "before *Daubert*, once an expert's credentials were established, courts were understandably reluctant to evaluate the expert's testimony and left that evaluation to the jury. . . . After *Daubert*, federal trial judges are required to make their own assessment of whether the methodology underlying an expert's opinion is fundamentally sound." *Id.*; see also Stephen D. Easton, "Yer Outta Here!": A Framework for Analyzing the Potential Exclusion of Expert Testimony Under the Federal Rules of Evidence, 32 U. RICH. L. REV. 1, 14 (1998). Easton asserted that before *Daubert*, trial courts seldom excluded expert testimony, but that since then "trial court judges have demonstrated new zeal for their gatekeeping responsibility . . . [having] a healthy dose of skepticism that leads to a legitimate review of the reliability of expert opinions and an increased willingness to exclude faulty expert testimony." *Id.*

⁷³ See Rosenberg, *supra* note 10, at 660-61.

⁷⁴ See *id.* at 662-63.

⁷⁵ See *Pierce v. Underwood*, 487 U.S. 552, 559-62 (1988) (stating that standard of review is sometimes determined by which judicial actor is better positioned to decide issue in question); cf. Ronald R. Hofer, *Standards of Review — Looking Beyond the Labels*, 74 MARQ. L. REV.

better position to make determinations than appellate courts for a number of reasons. First, trial courts may have an institutional advantage over appellate courts in making some decisions because trial judges may be able to draw on experiences not available to the higher courts. As the *Koon* Court stated about departures from the sentencing guidelines:

[These] are matters determined in large part by comparison with the facts of other Guidelines cases. District courts have an institutional advantage over appellate courts in making these sorts of determinations, especially as they see so many more Guidelines cases than appellate courts do. In 1994, for example, 93.9% of Guidelines cases were not appealed.⁷⁶

Although similar facts for scientific evidence questions are not available, trial courts as a whole must rule on more such matters than appellate courts. In the criminal context, for example, the parties will seldom appeal a trial court rejection of scientific evidence proffered by the prosecutor. If the accused is acquitted, double jeopardy will normally prevent a prosecutorial appeal of the exclusion of evidence. If the accused is convicted, the prosecutor, as the prevailing party, will normally not have standing to raise the evidentiary ruling on appeal. In criminal cases, then, appeals courts will only see scientific evidence rulings that went against a defendant who was convicted.

While the situation may not be as stark in civil cases, appeals courts will not see admissibility decisions that went against the party who won at trial. In addition, appeals courts will not see a trial court decision on admissibility if the case was settled without a trial after the evidentiary ruling. As a result, appellate courts do

231, 238 (1991). Hofer asserted that

[t]he rationale behind all appellate review may be fairly characterized in two extremes: an appellate court will defer in large part to a trial court's determination where the lower court is in a better position to make that determination than is the appellate court; conversely, little or no deference is accorded where the appellate court is as capable of determining the question as is the trial court.

Id. (quoting *State v. Pepin*, 110 Wis. 2d 431, 435-36 (Ct. App. 1982)); see also O'Neill, *supra* note 38, at 901 (positing that "[a]n appropriate review standard must take into account the institutional functions of courts").

⁷⁶ *Koon v. United States*, 518 U.S. 81, 98 (1996).

not see all the scientific evidence rulings issued by the trial courts.

Appellate courts, however, will never see all trial court rulings of whatever ilk. If lesser appellate exposure to a legal problem by itself justifies deference to trial court decisions, every trial court ruling should be reviewed deferentially. *Koon*, however, relied on more than just the experience differential between trial and appellate courts. Rather, the *Koon* Court also relied on some unique factors about Sentencing Guidelines cases. Trial courts regularly apply the Guidelines — they do so every time they sentence a defendant, and sentencing is a routine occurrence in federal court. Most sentences fall within the Guidelines and are not appealed. Consequently, trial courts see sixteen times the Guidelines cases that appellate courts do,⁷⁷ and appellate courts generally see only departures from the Guidelines. As a result, only trial courts have the necessary experience to decide if the Guidelines should control. A court can properly determine whether a departure is warranted only by comparing the purported distinguishing factors from those present in the full range of cases that fall within the Guidelines.⁷⁸ While trial courts regularly see cases falling within the Guidelines, appellate courts do not. This experience places trial judges in a better position to determine whether a departure is warranted, and, therefore, deference should be granted to trial court departure decisions.

Trial courts do not retain this comparative institutional advantage, however, when they issue rulings on scientific evidence. First, it is unlikely that trial courts make as many decisions about the admissibility of such evidence as they do about the Guidelines. More important, unlike departure decisions, the trial courts are not gaining essential experience with scientific evidence that is unavailable to appellate courts.⁷⁹ The primary job of a trial court

⁷⁷ See *id.*

⁷⁸ See *id.* (stating that “[w]hether a given factor is present to a degree not adequately considered by the Commission, or whether a discouraged factor nonetheless justifies departure because it is present in some unusual or exceptional way, are matters determined in large part by comparison with the facts of other Guidelines cases”).

⁷⁹ Surely federal trial judges do not encounter challenged scientific evidence as often as they sentence. Furthermore, because the overwhelming number of those sentencing determinations are not departures from the Guidelines, few of these sentences are likely to be appealed no matter what the standard of review.

With scientific evidence, any civil party who lost the trial court ruling and then lost the case in the trial court, whether by trial or summary judgment, has an incentive to appeal that trial court evidentiary ruling. Similarly, almost any defendant convicted at trial who lost such a ruling has reason to appeal the evidentiary decision. As a result, a higher percentage

with scientific evidence is not simply to compare it with scientific evidence proffered in other cases. Instead, the trial court must measure the challenged evidence against *Daubert's* requirements, and appellate courts have just as much access to those requirements as do the trial courts. Even if trial courts are exposed to scientific evidence questions more often than appellate courts, that increased experience does not necessarily make trial courts more competent to decide whether scientific evidence is admissible.

If trial courts are truly more competent than appellate courts in determining admissibility, it must be for some other reason than experience. The most common rationale for ceding the trial court an institutional advantage is that the trial court personally witnessed the hearing or trial, giving that court information that an appellate record cannot convey.⁸⁰ As Professor Rosenberg cautions, however, the immediacy of a trial court's position does not always mean that its decisions deserve deference.

That is a sound and proper reason for conferring a substantial measure of respect to the trial judge's ruling whenever it is based on facts or circumstances that are critical to decision and that the record imperfectly conveys. This reason is a discriminating one, for it helps identify the subject matter as to which an appellate court should defer to the trial judge. . . .⁸¹

of scientific evidence questions are probably appealed than sentences. Moreover, because appeals courts sit in panels, three appellate judges are exposed to the scientific evidence question every time one is appealed. Consequently, appellate judges can have nearly as much opportunity to see a broad range of scientific evidence questions as does an individual trial judge.

The abuse of discretion review standard for scientific evidence will discourage appeals and decrease appellate opportunities to be familiar with scientific evidence, but using this fact to justify abuse of discretion review is a circular argument not based on the inherent institutional advantages trial courts have over appellate courts.

⁸⁰ See Rosenberg, *supra* note 10, at 663. Rosenberg asserted:

[P]robably the most pointed and helpful [reason] for bestowing discretion on the trial judge as to many matters is, paradoxically, the superiority of his nether position. It is not that he knows more than his loftier brothers; rather, he sees more and senses more. In the dialogue between the appellate judges and the trial judge, the former often seem to be saying: "You were there. We do not think we would have done what you did, but we were not present and we may be unaware of significant matters, for the record does not adequately convey to us all that went on at the trial. Therefore, we defer to you."

Id.

⁸¹ *Id.* at 664-65; cf. David P. Leonard, *Power and Responsibility in Evidence Law*, 63 S. CAL.

Certainly an appellate record cannot capture all of the reasons for a trial court's decision when the trial court has heard witnesses and made credibility determinations about their testimony that are crucial to the court's ruling.⁸² Credibility assessments depend on many things, such as demeanor, that cannot be adequately conveyed in a record, and therefore, our system operates under the assumption that those who have observed the witnesses are in a better position to assess credibility than those who only rely on the record. When credibility is critical to a ruling and the trial court has observed the witnesses, the trial court is institutionally more competent to make the decision than an appellate court.⁸³

While witnesses may testify to aid a *Daubert* ruling, personal credibility is seldom at the core of a decision regarding the admis-

L. REV. 937, 979 (1990).

In particular, Leonard stated that "the issue is the appellate court's *ability* to decide that the trial court did indeed commit error. When the appellate court cannot make that determination precisely because of the trial court's unique and superior position in applying certain judgement-based evidentiary rules, then deference is proper. . . ." *Id.*; see also *United States v. Taylor*, 487 U.S. 326, 346-47 (1988) (Stevens, J., dissenting). Justice Stevens concluded that deference should be granted to a trial court decision to dismiss with prejudice because of a Speedy Trial Act violation because a trial judge

has a much better understanding, not only of what actually happened, but also of the significance of certain events, than does a judge who must reconstruct that history from a confusing sequence of written orders and motions. Moreover, the trial judge is privy to certain information not always reflected in the appellate record. . . .

Id.

⁸² See *Thompson v. Keohane*, 516 U.S. 99, 111 (1995) (outlining when Supreme Court should defer to district court). The Supreme Court has granted deference to district court habeas corpus determinations for

issues encompass[ing] more than "basic, primary, or historical facts," [when] their resolution depends heavily on the trial court's appraisal of witness credibility and demeanor. . . . This Court has reasoned that a trial court is better positioned to make decisions of this genre, and has therefore accorded the judgment of the jurist-observer "presumptive weight."

Id.; cf. Henry J. Friendly, *Indiscretion About Discretion*, 31 EMORY L.J. 747, 759 (1982). Friendly explained that "[t]he most notable exception to full appellate review is deference to the trial court's determination of the facts. The trial court's direct contact with the witnesses places it in a superior position to perform this task." *Id.*, see also O'Neill, *supra* note 38, at 902 (explaining advantages that trial courts have over appellate courts). O'Neill stated that "[t]rial courts enjoy their greatest advantage over appellate courts in making findings of fact from evidence presented directly at trial. This is especially significant when the factual findings are based upon an evaluation of the credibility of witnesses as they have appeared on the stand before a trial judge." *Id.*

⁸³ See *Rosenberg*, *supra* note 10, at 664 (noting that trial judge "smells the smoke of battle and can get a sense of the interpersonal dynamics between the lawyers and the jury").

sibility of scientific evidence.⁸⁴ *Daubert* commands the trial court to assess the science, and science is based not on the word of a scientist,⁸⁵ but data which is available to all.⁸⁶ Methods and content, not personal authority,⁸⁷ define science.⁸⁸ The crucial debates for the admissibility of scientific evidence center not on the credibility of witnesses, but on the meaning and inferences that one can extract from the presented data and studies or the lack of such information.⁸⁹ The trial court does not have a privileged position over the appellate court in making such assessments because appellate

⁸⁴ There, perhaps, could be a dispute over whether a study was peer reviewed or published or had its results doctored. The personal credibility of witnesses would have to be assessed. If so, the trial court would be in a better position than an appellate court to determine who was telling the truth about such matters.

⁸⁵ Cf. MICHAEL J. SAKS & RICHARD VAN DUIZEND, *THE USE OF SCIENTIFIC EVIDENCE IN LITIGATION* 5 (1983) (asserting that "the fact-finder need never take a scientific expert witness's 'word for it'").

⁸⁶ See ROBERT K. MERTON, *THE SOCIOLOGY OF SCIENCE: THEORETICAL AND EMPIRICAL INVESTIGATIONS* 273-74 (Norman W. Storer ed., 1973). Merton stated that "[t]he substantive findings of science are a product of social collaboration and are assigned to the community . . . [There is] an imperative for the communication of findings. Secrecy is the antithesis of this norm. . . ." *Id.*

⁸⁷ Cf. BRUNO LATOUR, *SCIENCE IN ACTION: HOW TO FOLLOW SCIENTISTS AND ENGINEERS THROUGH SOCIETY* 31 (1987) (arguing that "[s]cience is seen as the opposite of the argument from authority"); KARL POPPER, *THE LOGIC OF SCIENTIFIC DISCOVERY* 46 (Torchbook ed. 1965) (explaining that no matter how intensely felt "a subjective experience, or a feeling of conviction, can never justify a scientific statement. . . ."); Alexander Morgan Capron, *Daubert and the Quest for Value-Free "Scientific Knowledge" in the Courtroom*, 30 U. RICH. L. REV. 85, 86 (1996) (asserting that "[s]cience is oriented toward the truth but its claims are presented tentatively and are subject to refutation, with an emphasis on the quality of the data rather than on decision produced by an hierarchical structure").

⁸⁸ Cf. MERTON, *supra* note 86, at 270 (stating that scientific claims are "subjected to preestablished impersonal criteria; consonant with observation and with previously confirmed knowledge. The acceptance or rejection of claims entering the lists of science is not to depend on the personal or social attributes of their protagonists. . . ."); STEVEN ROSE, *THE MAKING OF MEMORY: FROM MOLECULES TO MIND* 185 (Anchor ed., Doubleday 1993) (noting that "[t]his is what is meant by claiming that scientific knowledge is 'public' knowledge — that is, that it is in principle testable and verifiable by anyone/everyone and not merely a matter of private belief"); Murray Levine, *Scientific Method and the Adversary Model: Some Preliminary Thoughts*, AM. PSYCHOLOGIST 661, 664 (Sept. 1974) (explaining scientific method canons). Levine stated:

The canons of method require that we admit as scientific only that which is public and communicable. By those terms we mean that the observations may be made by any qualified observer who is in a position to observe and that we can tell the new observer how to put himself in such a position.

Id.

⁸⁹ Cf. Fenner, *supra* note 8, at 1030 (stating that "review of a dispute among experts, often including experts whose expertise was brought to bear only after preparation for the lawsuit had begun, [may] involve assessing the truthfulness of the witnesses").

judges can have direct access to the scientific material.⁹⁰

For example, *Joiner's* dispute over the admissibility of scientific evidence did not hinge on the credibility of the witnesses. Instead, the dispute was over methods, data, and most centrally, the inferences to be drawn from that data. *Joiner*, itself, seemed to recognize this. Relying on *Daubert's* statement that the admissibility inquiry must focus on principles and methods, not on the resulting conclusions, *Joiner* claimed that the trial court was merely differing with expert conclusions. The Court responded:

[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 require 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 opinion proffered.⁹¹

When scientific evidence is challenged, the crucial debate will frequently be over whether the methods producing the data were sound or whether the analytic gap between the data and proffered opinion was too large.⁹² These central issues will not be settled by assessing the credibility of witnesses. Instead, they will be resolved by examining the relevant scientific information — data to which both the trial and appellate court have equal access.

Joiner again illustrates this. The Supreme Court ultimately held that the *Joiner* trial court had not abused its discretion in excluding the disputed evidence. At issue were the opinions of *Joiner's* experts who, relying on animal and epidemiological studies, concluded that PCBs and their derivatives caused or promoted *Joiner's* lung cancer. The trial court concluded that the experts' reliance on the animal studies was not a proper basis under *Daubert* for the proffered opinion "for several reasons. First, there are only two studies. Second, the studies obviously used massive doses of PCBs.

⁹⁰ The trial court has the advantage that it can ask witnesses at a hearing questions to clarify the material, while an appellate court cannot. But the appeals court will still have access to the information that the trial court elicited. The appeals court will just not be able to ask clarifying questions that the trial court did not ask.

⁹¹ *General Elec. Co. v. Joiner*, 118 S. Ct. 512, 519 (1997).

⁹² See *id.* (stating that courts may find that "there is simply too great an analytical gap between the data and the opinion proffered").

Finally, [the mice studies were only of a] 'preliminary nature.'⁹³

The Supreme Court upheld this trial court ruling. "The [animal] studies were so dissimilar to the facts presented in this litigation that it was not an abuse of discretion for the District Court to have rejected the experts' reliance on them."⁹⁴ *Joiner*, thus, deferred to the trial court's determination, but the reason for the deference was not because the trial court alone had access to crucial information. Instead, the Supreme Court gave reasons why the studies did not support the expert opinions and then concluded that the studies were "dissimilar."⁹⁵ The Court's opinion indicates that it had the information to decide whether the data adequately supported the proffered expert testimony.⁹⁶

The Supreme Court has indicated elsewhere, however, that trial courts may still be due deference even when appellate courts have

⁹³ *Joiner v. General Elec. Co.*, 864 F. Supp. 1310, 1323 (N.D. Ga. 1994). The district court continued that because the defendants had cast sufficient doubt on the use of the mice studies, "the burden shifts to Plaintiffs to demonstrate by a preponderance of proof that their experts' opinions are admissible." *Id.* at 1324. The court concluded that plaintiffs' response was to argue that animal studies can be good grounds for an opinion, but did not address "the deficiencies that Defendants have highlighted in the experts' reliance on the animal studies at issue here." *Id.* The court also concluded that "Plaintiffs' argument, being unresponsive to the issue at hand, does not persuade the court to change its finding that Plaintiffs' experts erred in relying on the mice studies. . . ." *Id.*

⁹⁴ *Joiner*, 118 S. Ct. at 518.

⁹⁵ *See id.* The Supreme Court stated:

The studies involved infant mice that had developed cancer after being exposed to PCBs. The infant mice in the studies had had massive doses of PCBs injected directly into their peritoneums or stomachs. *Joiner* was an adult human being whose alleged exposure to PCBs was far less than the exposure in the animal studies. The PCBs 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 0-500 parts per million. The cancer that these mice developed was alveologenic adenomas; *Joiner* had developed small-cell carcinomas. No study demonstrated that adult mice developed cancer after being exposed to PCBs. One of the experts admitted that no study had demonstrated that PCBs lead to cancer in any other species.

Id.

⁹⁶ The Court also gave reasons why the epidemiological studies were not a sufficient basis for the expert opinion. About one study, *Joiner* noted, "Given that [the authors] were unwilling to say that PCB exposure had caused cancer among the workers they examined, their study did not support the experts' conclusion that *Joiner's* exposure to PCBs caused his cancer." *Id.* About a second study, the Court stated that "[t]he increase, however, was not statistically significant and the authors of the study did not suggest a link between the increase in lung cancer deaths and exposure to PCBs." *Id.* at 519. The Court continued, stating that "[t]he third and fourth studies were likewise of no help[.]" and then detailed reasons. *Id.*

equal access to the necessary information. In *Andersen v. City of Bessemer City*,⁹⁷ the trial court had found a discriminatory intent under Title VII of the Civil Rights Act of 1964.⁹⁸ The Supreme Court concluded that intentional discrimination is a factual finding and that the review standard for such a finding is dictated by Federal Rule of Civil Procedure 52(a), which then stated: "Findings of fact shall not be set aside unless clearly erroneous, and due regard shall be given to the opportunity of the trial court to judge the credibility of witnesses."⁹⁹

The Court held that under Rule 52(a) deference must be granted "even when the district court's findings do not rest on a credibility determination, but are based instead on physical or documentary evidence or inferences from other facts."¹⁰⁰ The Court conceded that "an impressive genealogy" maintained that when trial courts make decisions based on nontestimonial evidence, review should be de novo because the appellate court has the same access to information as the trial court. The Court rejected that position and continued that "it is impossible to trace the theory's lineage back to the text of Rule 52(a). . . ."¹⁰¹

⁹⁷ 470 U.S. 564 (1985).

⁹⁸ 42 U.S.C. § 2000e to e-17 (1994).

⁹⁹ *Bessemer City*, 470 U.S. at 573. Since then, Rule 52(a) has been amended to include a specific reference to documentary evidence. "Findings of fact, whether based on oral or documentary evidence, shall not be set aside unless clearly erroneous, and due regard shall be given to the opportunity of the trial court to judge of the credibility of the witnesses." FED. R. CIV. P. 52(a).

¹⁰⁰ *Bessemer City*, 470 U.S. at 574; *accord* *Icicle Seafoods, Inc. v. Worthington*, 475 U.S. 709, 714-15 (1986).

¹⁰¹ *Bessemer City*, 470 U.S. at 574. The Court was referring to Judge Frank's opinion, to which Judge Augustus Hand subscribed, in *Orvis v. Higgins*, 180 F.2d 537 (2d Cir. 1950). *Orvis* adopted "approximate gradations" of review:

Where a trial judge sits without a jury, the rule varies with the character of the evidence: (a) If he decides a fact issue on written evidence alone, we are as able as he to determine credibility, and so we may disregard his finding. (b) Where the evidence is partly oral and the balance is written or deals with undisputed facts, then we may ignore the trial judge's finding and substitute our own, (1) if the written evidence or some undisputed fact renders the credibility of the oral testimony extremely doubtful, or (2) if the trial judge's finding must rest exclusively on the written evidence or the undisputed facts, so that his evaluation of credibility has no significance. (c) But where the evidence supporting his finding as to any fact issue is entirely oral testimony, we may disturb that finding only in the most unusual circumstances.

Id. at 539-40 (citations omitted). The crucial factor in this scheme is "our inability to appraise the cogency of demeanor evidence, lost to us because it cannot be captured in the witness' words as recorded on paper." *Id.* at 538-39. The court ultimately substituted its judgment for the trial court not because it differed on credibility assessments. Instead,

Appellate review of the admissibility of scientific evidence is similar to reviewing a trial court finding based on documentary evidence. What is crucial is not a credibility determination affected by witnesses' demeanor, but the inferences to be drawn from material equally accessible to both trial and appellate courts. *Bessemer City* held that despite this equal access, the appellate court must grant the trial court deference. Of course, *Bessemer City* was interpreting Federal Rule of Civil Procedure Rule 52(a), and the Federal Rules of Evidence do not contain a comparable standard of review provision.¹⁰² *Bessemer City*, however, also provides reasons as to why such deference should be granted when a witness's credibility is not at stake.

The rationale for deference to the original finder of fact is not limited to the superiority of the trial judge's position to make determinations of credibility. The trial judge's major role is the determination of fact, and with experience in fulfilling that role comes expertise. Duplication of the trial judge's efforts in the court of appeals would very likely contribute only negligibly to the accuracy of fact determination at a huge cost in diversion of judicial resources.¹⁰³

Even without credibility determinations, deference should be granted to the trial courts because of their greater expertise in fact-finding. *Bessemer City*'s premise is that with the trial court's repeated role in determining facts comes a general expertise in fact-finding. Accordingly, even if a trial court has never before faced the question of fact it must confront in a given case, general expertise in fact-finding provides the court with the necessary

"[w]e differ from him solely about the inference which may reasonably be drawn from the evidence, assuming without question that the witnesses he credited spoke the truth." *Id.* at 541 (citations omitted).

¹⁰² See *Ornelas v. United States*, 517 U.S. 690, 695 n.3 (1996). According to the *Ornelas* Court:

While the Seventh Circuit uses the term "clear error" to denote the deferential standard applied when reviewing determinations of reasonable suspicion or probable cause, we think the preferable term is "abuse of discretion. . . . "Clear error" is a term of art derived from Rule 52(a) of the Federal Rules of Civil Procedure, and applies when reviewing questions of fact.

Id. (citation omitted).

¹⁰³ *Bessemer City*, 470 U.S. at 574-75.

experience.

It is questionable whether that logic applies to scientific evidence. Does experience in determining whether a person was a "seaman,"¹⁰⁴ whether a person is competent to stand trial,¹⁰⁵ whether "special factors" existed in setting fees under the Equal Access to Justice Act,¹⁰⁶ or whether guns were drawn during an interrogation¹⁰⁷ give trial courts expertise in deciding whether "good grounds" exist as defined by *Daubert* for proffered scientific evidence?¹⁰⁸ Is the determination of scientific reliability really part of the same continuum of factual determinations or is it of a different kind?

Certainly some judges have disclaimed special competence when it comes to scientific evidence.¹⁰⁹ While judges can generally rely on their common sense and experience to make factual determinations, *Daubert* demands an understanding of scientific information

¹⁰⁴ See *Icicle Seafoods, Inc. v. Worthington*, 475 U.S. 709, 713-14 (1986).

¹⁰⁵ See *Maggio v. Fulford*, 462 U.S. 111, 117 (1983).

¹⁰⁶ See *Pierce v. Underwood*, 487 U.S. 552, 557-59 (1988).

¹⁰⁷ See *Thompson v. Keohane*, 516 U.S. 99, 112 (1995) (abuse of discretion review for historical facts underlying "custody" determinations).

¹⁰⁸ See *Kunsch*, *supra* note 49, at 23 (asserting that "[c]ertainly a trial judge's ruling on the admissibility of evidence cannot be characterized as a question of fact [but rather it is] probably best characterized as one of law").

¹⁰⁹ See *Daubert v. Merrell Dow Pharms., Inc.*, 43 F.3d 1311, 1316 (9th Cir. 1995). For example, the Ninth Circuit on remand in *Daubert* said that

though we are largely untrained in science and certainly no match for any of the witnesses whose testimony we are reviewing, it is our responsibility to determine whether those experts' proposed testimony amounts to "scientific knowledge," constitutes "good science," and was "derived by the scientific method."

.....

Mindful of our position in the hierarchy of the federal judiciary, we take a deep breath and proceed with this task.

Id.; see also *Fenner*, *supra* note 8, at 1031. Professor *Fenner* commented:

Other cases have made the same point, perhaps less sarcastically, saying that judges should keep in mind their own limited scientific knowledge, their lack of special competence in these areas, and that they may bring their own biases and errors to these admissibility decisions.

.....

Many of us went to law school to avoid science or, for that matter, anything else that uses numbers other than to reference volumes and page numbers. Many of us suffer from arithmophobia. Here we are now, in these cases, thrown right into the middle of the thing we were trying to escape.

Id. (citations omitted).

that ordinary experience and legal training do not provide.¹¹⁰ In this area where many judges doubt their proficiency, one cannot simply assume that trial court judges are better at applying *Daubert* than other judges.¹¹¹

Moreover, the collegial nature of the appellate process may provide appellate courts with an institutional advantage over trial courts. As Judge Friendly explained:

One member of a panel may bring an entirely fresh insight not shared by the trial court or by counsel. Assuming that all panel members take seriously their responsibility for independent exercise of judgment, the give and take of discussion may produce a result better than any single mind could reach. Finally, collegial review tends to eliminate or curtail decisions based on impermissible factors. I am not thinking of the rare cases of venality or of prejudice in its most pejorative sense, but rather of the subconscious mind-set from which few judges are immune.¹¹²

Because scientific evidence decisions are different from other kinds of adjudications, they may especially benefit from the give and take of collegial review.

Finally, although *Bessemmer City* stated that deference was required for all trial court findings of fact under Rule 52(a), that Court, in effect, endorsed a sliding scale of review depending on what sort of information the trial court had relied upon. The Court suggested

¹¹⁰ See William W. Schwarzer, *Introduction to REFERENCE MANUAL ON SCIENTIFIC EVIDENCE* 1-3 (Federal Judicial Center 1994). Schwarzer stated:

No longer can judges . . . rely on their common sense and experience in evaluating the testimony of many experts

[S]uch a standard demands an understanding by judges of the principles and methods that underlie scientific studies and the reasoning on which expert evidence is based. This is a task for which few judges are adequately prepared when they arrive on the bench. Without a background in the sciences, many judges find it difficult to master the many areas of expert evidence without neglecting the needs of the remainder of their caseload.

Id.

¹¹¹ Cf. *Louis*, *supra* note 7, at 1038, 1040 (referring to both procedural and evidentiary questions as "procedural" and concluding that "[a]n appellate court is . . . likely to be more expert and reliable in matters of procedure than is a single trial judge").

¹¹² Friendly, *supra* note 82, at 757; see also Rosenberg, *supra* note 10, at 642 (asserting that "since most . . . appellate courts are collegial, our fondness for appellate review may also reflect a feeling that there is safety in numbers").

that reversals are more appropriate when the necessary information is equally available to a reviewing court:

When findings are based on determinations regarding the credibility of witnesses, Rule 52(a) demands *even greater* deference to the trial court findings; for only the trial judge can be aware of the variations in demeanor and tone of voice that bear so heavily on the listener's understanding of and belief in what is said. . . . Documents or objective evidence[, however,] may contradict the witness' story; or the story itself may be so internally inconsistent or implausible on its face that a reasonable factfinder could not credit it. Where such factors are present, the court of appeals may well find clear error even in a finding purportedly based on a credibility determination.¹¹³

If clearly erroneous review ultimately varies depending upon the nature of the information considered,¹¹⁴ the same might be true for abuse of discretion review of scientific evidence. Perhaps because of the nature of the information used in making determinations about scientific evidence, an appellate court might see that abuse standard as a sliding one and engage in a stricter examination than it would for other abuse of discretion issues.¹¹⁵

Joiner, however, does not support such a sliding scale approach. While not specifically addressing that possibility, the Court did

¹¹³ *Anderson v. City of Bessemer City*, 470 U.S. 564, 575 (1985) (emphasis added). The Court continued,

But when a trial judge's finding is based on his decision to credit the testimony of one or two or more witnesses, each of whom has told a coherent and facially plausible story that is not contradicted by extrinsic evidence, that finding, if not internally inconsistent, can virtually never be clear error.

Id.

¹¹⁴ See *Cooper*, *supra* note 50, at 654:

[T]he Supreme Court has recognized that greater deference is due to findings based on the credibility of witnesses. In addition, it has suggested that more searching review is appropriate if there is a conflict between testimonial and documentary evidence. . . . [T]he actual degree of scrutiny required by the clear error standard varies according to the nature of the evidence.

¹¹⁵ See *Lee*, *supra* note 2, at 37 (stating that abuse of discretion has varying levels, including "nondeferential, moderately deferential, substantially deferential, and completely deferential review").

expressly reject the Eleventh Circuit's notion of rigorous abuse of discretion review. The circuit court in *Joiner* held that evidentiary admissibility decisions were reviewed for an abuse of discretion, but then continued, "Because 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."¹¹⁶ The Supreme Court, however, rejected the notion that different review standards should apply depending on whether the evidence was admitted or excluded.¹¹⁷ The Court held that abuse of discretion review applies to the admissibility of expert testimony and concluded, "In applying an overly 'stringent' review . . . , [the Eleventh Circuit] failed to give the trial court the deference that is the hallmark of abuse of discretion review."¹¹⁸ Nothing in this logic indicates that abuse of discretion review for scientific evidence is different from abuse of discretion review for any other evidentiary decision. Deviation from this usual standard, if it is wise, will have to be authorized by the rule-making authority.

D. Meaningful Precedent

The abuse of discretion review standard may also be justified because appellate courts will be unable to generate meaningful precedent. A major function of appellate courts is to formulate rules of general applicability that will govern future cases.¹¹⁹ A goal

¹¹⁶ *Joiner v. General Elec. Co.*, 78 F.3d 524, 529 (11th Cir. 1996).

¹¹⁷ See *id.* at 517. The *Joiner* court also stated:

We likewise reject respondent's argument that because the granting of summary judgment in this case was "outcome determinative," it should have been subjected to a more searching standard of review. On a motion for summary judgment, disputed issues of fact are resolved against the moving party. . . . But the question of admissibility of expert testimony is not such an issue of fact, and is reviewable under the abuse of discretion standard.

Id.

¹¹⁸ *Id.*

¹¹⁹ See Cooper, *supra* note 50, at 649 (noting that "the federal courts of appeals serve two functions: the correction of error in individual cases and the development of the law in ways that will guide future conduct and future litigation"); see also Louis, *supra* note 7, at 1006 (asserting that appellate courts' two principle functions are declaring law and supervising lower court decisions); cf. O'Neill, *supra* note 38, at 901 (arguing that appellate courts have three essential functions). O'Neill asserted:

of law is to treat like situations alike.¹²⁰ Deference to trial courts can conflict with this desired consistency.¹²¹ If, however, the issue is not one that will benefit from the establishment of general rules, deference to the trial court may be appropriate.¹²² As Professor Rosenberg stated:

One of the "good" reasons for conferring discretion on the trial judge is the sheer impracticability of formulating a rule of decision for the matter in issue. Many questions that arise in litigation are not amenable to regulation by rule because they involve multifarious, fleeting, special, narrow facts that utterly resist generalization — at least, for the time being. . . . When the ruling under attack is one that does not seem to admit of control by a rule that can be formulated or criteria that can be indicated, prudence and necessity agree it should be left in the control of the judge at the trial level.¹²³

When the factors underlying the trial court's ruling are either so variable or so specific they are unlikely to recur, the appellate court will be unable to announce a useful rule for future application.¹²⁴

First, appellate courts are well-suited to develop and declare legal principles that will apply beyond the case at bar and serve as precedent in future cases. Second, they traditionally provide a "corrective function" to guarantee that lower courts have done justice in a particular case. Finally, appellate courts can play a supervisory role, thereby ensuring that proper and consistent procedures have been followed throughout the circuit.

Id. (citations omitted).

¹²⁰ See Friendly, *supra* note 82, at 758 (quoting, in part, *Ward v. James*, [1966] 1 Q.B. 273, 294 (C.A.)). Friendly stated that "broad judicial review is necessary to preserve the most basic principle of jurisprudence that 'we must act alike in all cases of like nature.'" *Id.*; see also BENJAMIN CARDOZO, *THE NATURE OF THE JUDICIAL PROCESS* 33 (1921) (stating that "it will not do to decide the same question one way between one set of litigants and the opposite way between another").

¹²¹ See Evan Tsen Lee, *Principled Decision Making and the Proper Role of Federal Appellate Courts: The Mixed Questions Conflict*, 64 S. CAL. L. REV. 235, 247-48 (1991) (stating that "appellate courts are responsible for maintaining doctrinal uniformity"). Lee noted that "trial courts are inherently unable to maintain the necessary perspective and inter-court coordination to achieve such uniformity in their rulings." *Id.* at 248.

¹²² See Lee, *supra* note 2, at 34 (stating that "[d]e novo or nondeferential review is generally most effective when the issue being reviewed is capable of being generalized by a rule of broad application").

¹²³ Rosenberg, *supra* note 10, at 662.

¹²⁴ Cf. Friendly, *supra* note 82, at 760 (quoting, in part, *United States v. McCoy*, 517 F.2d 41, 44 (7th Cir. 1975)). Friendly maintained:

[A] principle supporting deference to rulings of the trial court is the absence

In such cases, courts do not have to be concerned with treating like cases in a dissimilar manner because it is improbable that another truly similar case will arise.¹²⁵ In these circumstances, deference to trial court decisions is appropriate because trial courts should have the flexibility to individualize justice for each singular situation.¹²⁶

This reasoning often justifies abuse of discretion review for evidence decisions. Flexible evidence rules are needed because each trial is unique, and trial courts must be able to take such distinctive settings into consideration in order to further the goal of finding truth in every case. Balancing must often be done, and trial courts can best do the weighing of numerous and subtle factors. An appellate court formulating strict evidentiary precedents will impede fair trials. Evidence rules, therefore, ought to be guidelines for exercising discretion rather than rigid mandates.¹²⁷ As long as trial courts make evidentiary rulings within those guidelines, appellate

of the benefits that ordinarily flow from appellate review in establishing rules that will govern future cases. This is true in the frequent situations described by Judge Stevens, as he then was, where the factors "are so numerous, variable and subtle that the fashioning of rigid rules would be more likely to impair [the trial judge's] ability to deal fairly with a particular problem than lead to a just result."

Id. (footnote omitted).

¹²⁵ See *Mucha v. King*, 792 F.2d 602, 605-06 (7th Cir. 1986). Judge Posner stated:

[T]he main reason for appellate deference to the findings of fact made by the trial court is not the appellate court's lack of access to the materials for decision but that its main responsibility is to maintain the uniformity and coherence of the law, a responsibility not engaged if the only question is the legal significance of a particular and nonrecurring set of historical events.

... Review is deferential precisely because it is so unlikely that there will be two identical cases; the appellate court's responsibility for maintaining the uniformity of legal doctrine is not triggered.

Id.

¹²⁶ See *Koon v. United States*, 518 U.S. 81, 98-99 (1996) (noting deference granted trial court departures from Sentencing Guidelines because they involve unique factors for which appellate courts cannot fashion clear guidelines); see also *Lee*, *supra* note 2, at 34. Lee stated that sentencing guidelines "cannot capture every possible fact relevant to sentencing. Departure policy enables sentencing courts to deviate from the Guidelines in cases involving circumstances not adequately reflected in the Guidelines." *Id.*; cf. *Leonard*, *supra* note 81, at 999 (stating that "[m]ore flexible standards allow the law to be individualized").

¹²⁷ Cf. *Leonard*, *supra* note 81, at 956. Leonard stated that evidence law has moved "away from fixed, 'per se' rules, and toward more flexible standards that are capable of adaptation to achieve fair and just results in particular cases." *Id.* (footnote omitted); see also *Mengler*, *supra* note 15, at 414 (arguing that evidence rules steer course between broad generalities and strict particularity).

courts should defer to their decisions.¹²⁸

Saying much the same thing, because of the singular nature of each trial and the evidentiary problems it spawns, an evidentiary ruling will be case specific. As a result, appellate courts will not be able to articulate clear rules of law that transcend the individual case and define how trial courts should decide future evidence problems.¹²⁹ Because evidence decisions depend on numerous and subtle nonrecurring factors that are best judged by the trial court and because appellate courts cannot fulfill their central function by making useful evidentiary precedents, deference should be granted to the trial courts.

Even if this reasoning supports deference to trial courts for most evidentiary rulings,¹³⁰ scientific evidence presents different considerations. The same historical question only rarely recurs in separate trials, and evidence issues concerning a specific historical question are unlikely to repeat. In contrast, the same scientific evidence question will often recur.¹³¹ For example, Mr. Joiner's

¹²⁸ Cf. Mengler, *supra* note 15, at 415. Professor Mengler stated: "[T]he appellate court's primary task is solely to check the overall fairness of a trial, not to fine-tune the Federal Rules [of Evidence], and in the process, undermine their flexibility through binding precedents." *Id.* (footnote omitted).

¹²⁹ See Cooper, *supra* note 50, at 662 ("Rules of law are useful means of control, but only to the extent that they can be stated with unescapable clarity.").

¹³⁰ Cf. Berger, *supra* note 14, at 897. Berger argued:

[S]ome of the Federal Rules, such as the great majority of the class hearsay exceptions, still employ a per se "rules" approach; hearsay offered pursuant to one of these exception is admissible only if certain specified conditions are satisfied. Other Federal Rules operate as "standards." They require the court to exercise its judgment in order to determine whether the rule will apply. . . .

Appellate courts often speak of reviewing the trial court's discretion regardless of whether they are dealing with a rule or a standard or a mixture of the two.

Id. (footnote omitted); see also Leonard, *supra* note 14, at 1163. Leonard stated that "[t]he rules of evidence . . . contain both judgment-based standards and clearer, per se tests. Appellate courts should not treat these two kinds of provisions equally, nor should it be assumed that appellate courts should review the application of all judgment-based standards with the same degree of deference." *Id.* (footnote omitted).

¹³¹ See Samuel R. Gross, *Substance and Form in Scientific Evidence: What Daubert Didn't Do*, 3 SHEPARD'S EXPERT & SCI. EVIDENCE Q. 129, 148 (Black et al. eds., 1995) (noting that "[t]he exact same scientific question can come up repeatedly, in dozens or thousands of cases; similar patterns are rare for ordinary historical issues, and when they do occur (e.g., common factual issues in airline crash cases), the number of trials involved is likely to be comparatively small"); cf. David L. Faigman, *Mapping the Labyrinth of Scientific Evidence*, 46 HASTINGS L.J. 555, 560 (1995). Faigman has maintained that "[t]he scientific method assumes the replicability of physical phenomena. But not all facts repeat themselves. The

personal exposure to PCBs is a unique historical question not likely to confront the courts in other cases. On the other hand, courts may repeatedly face the question of whether PCBs promote cancer,¹³² and other courts will likely confront the question of whether scientific evidence about the connection between PCBs and cancer should be admissible. For this reason, while evidentiary disputes should ordinarily not lead to appellate precedent, scientific evidence might benefit from uniform rules.¹³³

Just because the same or similar evidentiary disputes regarding scientific evidence repeat, however, does not mean that appellate precedents should necessarily be set for scientific evidence. The nature of science often makes the promulgation of meaningful precedent difficult for scientific evidence, even when the same issues reappear. Science is both provisional and continuing.¹³⁴ While scientific questions may recur, the scientific proof concerning an issue may differ significantly each time that issue is litigated as scientific information continues to accumulate and evolve. Thus, every time a scientific issue is presented, its accompanying evidentiary dispute may arise in a unique setting. Still, an appellate court ruling on admissibility in these circumstances can have value.

First, the appellate ruling can help insure that like cases are treated alike. If no new scientific information were available, precedent would control. The same issue in the same jurisdiction would not be treated differently, saving time and resources for both the trial court and future litigants.

Second, even when there is new scientific evidence and, therefore, precedent cannot control, something akin to traditional common law development may occur. If the appellate courts continue to articulate why a particular kind of scientific evidence is or

classic example of facts that are intensively studied but are not replicable are historical events." *Id.* (footnote omitted).

¹³² Cf. Joseph Sanders, *From Science to Evidence: The Testimony on Causation in the Bendectin Cases*, 46 STAN. L. REV. 1, 30 (1993). Sanders examined the scientific evidence at the Bendectin trials and concluded: "Even when different experts appeared, they presented basically the same testimony." *Id.* In one of the Bendectin cases, the court stated that "[t]he cases are variation on a theme, somewhat like an orchestra which travels to different music halls, substituting musicians from time to time but playing essentially the same repertoire." *Turpin v. Merrell Dow Pharms., Inc.*, 959 F.2d 1349, 1351 (6th Cir. 1992).

¹³³ See Faigman, *supra* note 20, at 974 (arguing that because questions of scientific evidence may transcend particular disputes, appellate courts must be afforded ability to resolve lower inconsistent court findings as likely to recur in other jurisdictions).

¹³⁴ See *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 597 (1993) (stating that "[s]cientific conclusions are subject to perpetual revision").

is not admissible, by carefully examining the differences in proof, lower courts may be able to extract principles that will guide them in deciding the new cases with additional scientific information.¹³⁵

This, however, may be a difficult process because it would require trial courts to be thoroughly familiar with the scientific evidence in each case of the possibly precedential line. Thus, when each case is unique because scientific information is rapidly developing and when much judicial effort would be necessary to extract precedential principles that might be difficult to formulate,¹³⁶ deference to the lower courts could be appropriate even with repeated scientific questions.

Yet not all of the repeatable scientific evidence issues are about scientific conclusions, where research may lead to additional, useful data. Rather, many of the scientific evidence debates focus on recurring methodological issues where meaningful precedent may be more useful because the facts and information underlying such issues are often stable and equally available to appellate courts. For example, issues concerning statistical significance can arise for many scientific studies.¹³⁷ While some scientists may customarily require a five percent significance level, is such exactitude necessary for a study to be admissible? Instead, "[s]ome commentators have suggested that the use of 'confidence intervals' provides more meaningful information than statistical significance because a range of possible values is presented that is consistent with the observed data."¹³⁸ Should a trial court's decision regarding the admissibility of such evidence be reviewed only for an abuse of discre-

¹³⁵ Cf. Margaret A. Berger, *Evidentiary Framework*, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 38, 70-71 (Federal Judicial Center 1994). Judicial attitudes towards scientific validity in toxic tort cases have evolved. See *id.* Berger proffered two reasons for this evolution:

1. Courts become more conversant with the parameters of scientific and probabilistic reasoning as they are exposed to complex statistical issues and problems of causation in cases rife with scientific uncertainty.
2. Courts become more knowledgeable about particular factual issues through the gradual accumulation of evidence as categories of related cases work their way through the litigation process and mature.

Id.

¹³⁶ Cf. *id.* at 70 (stating that "the scientific issues and the differing procedural postures in which these issues arise are too complex to be amenable to resolution by precise verbal formulas").

¹³⁷ See *id.* at 93 (maintaining that courts must decide whether or not to use statistical significance levels conventionally used in expert's field).

¹³⁸ *Id.*

tion? As the debate indicates, reasonable people differ as to how the issue should be treated. This implies that one trial court may exclude a study because it did not reach the five percent level of statistical significance, and the very same study accompanied by a confidence interval may be admitted elsewhere. With abuse of discretion review, an appellate court should affirm both rulings.

This deferential approach puts a substantial burden on the trial courts. Each time this issue is presented, a judge will have to master the meaning of the statistical concepts and the debate that surrounds them.¹³⁹ Yet, a meaningful appellate precedent about the proper method is possible because the facts underlying the dispute are not case specific and are available to the appellate court as well as the trial judge. Furthermore, precedent could be particularly useful because it could not only define the treatment of a specific study, but also indicate how statistical significance should be regarded for other studies.¹⁴⁰

This debate about statistical significance does not stand alone — it is just one example of the many disputes about methodology that recur. Methodological issues that transcend the specific case often have to be resolved in *Daubert* rulings.¹⁴¹ Indeed, such a methodological dispute is at the core of *Joiner*. Thus, Justice

¹³⁹ Cf. John Monahan & Laurens Walker, *Social Authority: Obtaining, Evaluating, and Establishing Social Science in Law*, 134 U. PA. L. REV. 477, 511 n.119 (1986) (positing that “[a]nyone who can comprehend the Federal Tort Claims Act can learn what standard deviation and statistical significance mean”).

¹⁴⁰ Cf. Berger, *supra* note 135, at 44. Berger stated that

[there are] many concrete interrelated scientific and legal issues that courts regularly must confront when a case revolves around scientific evidence. . . .

[I]t seems more fruitful to concentrate on specific problems that require a considerable investment of judicial time when experts seek to testify about scientific matters. Looking at how courts address frequently occurring fact patterns may identify the kinds of questions . . . that must be considered, and evidentiary and procedural solutions, compatible with *Daubert*'s objectives, that courts have used effectively.

Id.

¹⁴¹ See *id.* at 80, 90-91, 98, 101-02. (listing examples of *Daubert* rulings resolving issues transcending specific cases). Professor Berger's excellent essay gives a sampling. For example, is the testimony of a physician relying on the methodology of clinical medicine admissible to establish the cause of a disease or a birth defect? See *id.* at 80. What are the proper uses of meta-analyses, which combine results from separate studies on a common scientific issue? See *id.* at 90-91. “Should a court permit evidence of matching samples when no background rate is offered of the probability of a match or when there are disputes about the appropriate background rate?” *Id.* at 98. How or should proficiency test results be combined with a probability of a match? See *id.* at 101-02.

Stevens, concurring in part and dissenting in part, stated:

Joiner's experts used a "weight of the evidence" methodology to assess whether Joiner's exposure to transformer fluids promoted his lung cancer. They did not suggest that any one study provided adequate support for their conclusions, but instead relied on all the studies taken together (along with their interviews of Joiner and their review of his medical records). The District Court, however, examined the studies one by one and concluded that none was sufficient to show a link between PCBs and lung cancer. . . . The focus of the opinion was on the separate studies and the conclusions of the experts, not on the experts' methodology. . . .

Unlike the District Court, the Court of Appeals expressly decided that a "weight of the evidence" methodology was scientifically acceptable. To this extent, the Court of Appeals' opinion is persuasive.¹⁴²

The majority, however, did not resolve this methodological issue, but held that, at least in this case, the use of either method was not an abuse of discretion. "We . . . hold that, because it was within the District Court's discretion to conclude that the studies upon which the experts relied were not sufficient, *whether individually or in combination*, to support their conclusions . . . , the District Court did not abuse its discretion in excluding their testimony."¹⁴³ *Joiner*, therefore, does not give guidance to trial courts on how they should assess the "weight of the evidence" method in the future. As a result, trial courts examining the same scientific information may accept or dismiss this technique and, perhaps as a result, make contradictory, but affirmable, admissibility rulings.

Although it too was present, *Joiner* also did not address the issue that is crucial for many *Daubert* rulings: "To what extent may a court reject an expert's opinion on the ground that it rests on unfounded extrapolation?"¹⁴⁴ Scientific evidence is often challenged because the scientific data does not necessarily compel a particular conclusion, but instead an expert made a disputed inference from

¹⁴² General Elec. Co. v. Joiner, 118 S. Ct. 512, 522 (1997) (Stevens, J., concurring in part and dissenting in part) (footnotes omitted).

¹⁴³ *Id.* at 519 (emphasis added).

¹⁴⁴ Berger, *supra* note 135, at 78.

the available information. This extrapolation problem can take many forms, but in *Joiner*, as in many toxic torts cases, it centered on the use of animal studies. If animal studies can sometimes, but not always, support an expert opinion, what are the distinguishing conditions for such studies? Is it proper to extrapolate from a substance's effect on animals to the substance's effect on humans?¹⁴⁵ Can animal studies alone support a conclusion that a substance has a certain effect on humans? Does the admissibility of such studies change if there are supporting or contrary epidemiological studies? Are studies with humans always necessary to prove causation?

While questions such as these had to be resolved in *Joiner*, all the Supreme Court decided is that the trial judge did not abuse her discretion. Trial judges will confront similar issues again, but with abuse of discretion review in place, they will not have appellate guidance in how to address them. Trial court judges must start from scratch each time such an issue is presented, and abuse of discretion review gives them the freedom to decide the same issue differently from their colleagues no matter how often the issue has been confronted before.¹⁴⁶

¹⁴⁵ Cf. *id.* (asking whether courts can reject expert opinions because they rest on unfounded extrapolations). As Professor Berger noted:

For the results of [animal] studies to be probative, at least two assumptions must be made: (1) that if a substance is toxic in these species of animals it must also be toxic in humans; and (2) that one can extrapolate from the higher and more intense dosage level used in the study to the lower level to which the plaintiff was actually exposed.

Id.

¹⁴⁶ Cf. *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 781 (3d Cir. 1994) (holding that trial court abused its discretion in excluding particular animal studies). The court distinguished other cases that excluded similar studies

because most involved the exclusion of animal studies in the face of extensive epidemiological data that failed to support causation, because none involved studies on animals particularly similar to humans in the way they react to the chemical in question, and because none involved studies the federal government had relied on as a basis for concluding the chemical was a probable health hazard.

Id. at 780. The Eleventh Circuit in *Joiner* cited this portion of *Paoli* for the proposition that "it is improper to find research unreliable solely because it uses animal subjects." *Joiner v. General Elec. Co.*, 78 F.3d 524, 532 (11th Cir. 1996).

E. Novelty

Although much of the foregoing suggests that meaningful precedent can be established for scientific evidence, a final consideration indicates caution. Courts have only recently begun to grapple with many of the difficult issues that scientific evidence presents. This novelty, perhaps, should make precedent rare for scientific evidence even when precedents could be set. The Supreme Court considered a similar factor when it mandated deference to a trial court's determination that a litigant's position was not "substantially justified" under the Equal Access to Justice Act. As Justice Scalia stated for the unanimous Court in *Pierce v. Underwood*: "We think that the question whether the Government's litigating position has been 'substantially justified' is . . . such a multifarious and novel question, little susceptible, for the time being at least, of useful generalization, and likely to profit from the experience that an abuse-of-discretion rule will permit to develop."¹⁴⁷

Precedent is important, but should be set only when courts can be confident that sound rules will result. Scientific evidence may present that unusual area that Professor Rosenberg wrote about:

When the problem arises in a context so new and unsettled that the rule-makers do not yet know what factors should shape the result, the case may be a good one to leave to lower court discretion. . . . [This discretion] permits experience to accumulate at the lowest court level before the appellate judges commit themselves to a prescribed rule. By according the trial judge discretionary power, the appeal courts have a chance to bide their time until they see more clearly what factors are important to decision and how to take them into account.¹⁴⁸

Courts have not long been analyzing scientific evidence as *Daubert* commands.¹⁴⁹ Perhaps the issues need to percolate undisturbed in the lower courts for awhile longer before prescribed rules can be confidently set.¹⁵⁰ Such caution certainly should apply

¹⁴⁷ *Pierce v. Underwood*, 487 U.S. 552, 563 (1988).

¹⁴⁸ Rosenberg, *supra* note 10, at 662-63.

¹⁴⁹ Cf. PAUL F. ROTHSTEIN, MYRNA S. RAEDER & DAVID CRUMP, *EVIDENCE IN A NUTSHELL: STATE AND FEDERAL RULES 9* (3d ed. 1997) (stating that "[d]espite the period of time that the [Federal Rules of Evidence] have been in effect, they are 'new' as legal history and developments go").

¹⁵⁰ Cf. Berger, *supra* note 135, at 71 (noting that "the judicial desire for efficiency must

to scientific questions where information is rapidly evolving. Precedent set too hastily for such issues not only may have little meaning, it can be harmful to judicial authority. If appellate courts were to say, for example, that based on the presented proof, the opinion that PCBs promote cancer was not admissible under *Daubert*, but science subsequently discovers additional information that puts that ruling in doubt, another rule might have to be announced. Frequent reversals of this nature could undermine a court's moral authority.

Even when the scientific issue is not rapidly developing, however, the mere novelty of the question may counsel restraint. For example, the debate over whether studies should only be admitted when a prescribed statistical significance is met is not evolving in the sense that new data about it is likely to be generated. Scientific developments will not undermine a precedent on this issue. Even so, the issue is so new to the courts that, at least for the moment, it might be best to profit from the experience that deference to the trial court will permit to develop.

IV. A PROPOSED COURSE OF ACTION FOR THE RULE-MAKING AUTHORITY

The traditional reasons justifying abuse of discretion review do not clearly indicate what standard is most appropriate for decisions regarding the admissibility of scientific evidence. What this examination shows, however, is that many questions should be addressed if the rule-making authority were to contemplate adopting a different standard. How, then, should that authority proceed?

First, the rule-making authority should give serious thought to the standard of review for scientific evidence because science is playing an increasing role in our litigation, because the review standard can control the outcomes of cases,¹⁵¹ and because the al-

be balanced against the need to allow scientific issues an opportunity to develop").

¹⁵¹ See Lee, *supra* note 2, at 2 (maintaining that "[t]he applicable standard of review is extremely important because it can have just as much, if not more, influence upon the disposition of the appeal as the merits of the case"); cf. Louis, *supra* note 7, at 1002. Louis argued that

[t]he differences, if any, in the weights of evidence required by the three standards for reversal are slight and incapable of precise articulation. Consequently, an appellate court determined to reverse or set aside a particular factual finding probably will not be deterred by the greater deference that theoretically must be shown to particular fact

location of discretion is a fundamental issue for a legal system.¹⁵²

Second, while it may initially seem wise to adopt a functional approach that allows review standards to be set on a case-by-case basis,¹⁵³ such an ad hoc approach would be impractical. A general rule is necessary.¹⁵⁴

Third, the rule-making authority should examine alternatives to *Joiner's* abuse of discretion review. For other issues, the Court has rejected deferential review standards in order to advance uniform outcomes and prevent unacceptably varied results. For example, in *Ornelas v. United States*,¹⁵⁵ the Court held that a trial court's determination concerning reasonable suspicion to stop and probable cause to search, mixed questions of law and fact, should be reviewed de novo.¹⁵⁶ With deferential review, the Court reasoned, trial judges might reach different results even without a significant difference in facts. The Court stated: "Such varied results would be inconsistent with the idea of a unitary system of law. This, if a mat-

finders.

Id.

¹⁵² See Leonard, *supra* note 14, at 1156 (stating that "[a]t its core, the debate about discretion is a debate about the nature of legal rules and standards and the degree to which these mechanisms control the decision of cases"); see also Henry P. Monaghan, *Constitutional Fact Review*, 85 COLUM. L. REV. 229, 237 (1985) (discussing law application judgments). Monaghan stated that "[l]aw application is a distinctive operation. The real issue is not analytic, but allocative: what decisionmaker should decide the issue?" *Id.*

¹⁵³ Cf. Lee, *supra* note 2, at 21 (stating that "[a] functional approach to abuse of discretion review similar to the approach employed in mixed question cases, in which the standard of review varies depending upon the nature of the inquiry, would provide greater guidance to lower courts than the current amorphous standard").

¹⁵⁴ Cf. Louis, *supra* note 7, at 1012-13 (arguing that judge should not decide allocation of decision for every mixed question). Louis stated:

Should courts . . . make an ad hoc assessment of relative competence for every mixed question [of fact and law] going to the merits. . . ? Making such an assessment accurately, openly, and candidly is never easy; making it for every material element of every possible claim and defense on the merits would be endless, confusing, and uncertain. A general rule presumptively favoring either the fact finders or the appellate judges, with whatever controls and exceptions are necessary, is all that is practically possible. . . .

Id.; see also Richard A. Epstein, *Judicial Control over Expert Testimony: Of Deference and Education*, 87 NW. U. L. REV. 1156, 1162 (1993) (arguing that expert qualification rules promote uniformity). Epstein posited: "The rules concerning the qualification of experts make sense for the same reasons as the hearsay exclusion. Uniform judgments are preferred to ad hoc ones. Quick and simple rules are preferred to endless disputations. And categorical rules are thought to yield more reliable results, in any event." *Id.*

¹⁵⁵ 517 U.S. 690 (1996).

¹⁵⁶ See *id.* at 692.

ter-of-course, would be unacceptable."¹⁵⁷ Furthermore, because these mixed questions "acquire content only through application, [i]ndependent review is . . . necessary if appellate courts are to maintain control of and to clarify the legal principles. . . . Finally, de novo review tends to unify precedent" and will best establish rules so the police know how to act.¹⁵⁸

Independent review, the Court continued, is warranted even though "the mosaic which is analyzed . . . is multi-faceted. . . ." ¹⁵⁹ While one case is unlikely to lead to binding precedent for another, sometimes the facts of separate cases will closely resemble each other, "[a]nd even where one case may not squarely control another one, the two decisions when viewed together may usefully add to the body of law on the subject."¹⁶⁰

For similar reasons, *Thompson v. Keohane*,¹⁶¹ decided earlier in the same Term as *Ornelas*, held that the "in custody" requirement of the habeas corpus statute should receive independent appellate review. While a state's determination of the "historical facts" was entitled to deference, the "in custody" determination is a mixed question of fact and law not entitled to deference because "the law declaration aspect of independent review potentially may guide police, unify precedent, and stabilize the law."¹⁶²

A similar approach could be used for scientific evidence. Its admissibility is not a question of historical fact, but one of law or a mixed question of fact and law.¹⁶³ The basic or historical facts underlying the decision — whether testing was done, published, peer reviewed, and so on — could be reviewed deferentially with the

¹⁵⁷ *Id.* at 697.

¹⁵⁸ *Id.*

¹⁵⁹ *Id.* at 698.

¹⁶⁰ *Id.*

¹⁶¹ 516 U.S. 99 (1995).

¹⁶² *Id.* at 115.

¹⁶³ Cf. Scott Brewer, *Scientific Expert Testimony and Intellectual Due Process*, 107 YALE L.J. 1535, 1543 (1998). Brewer stated:

Decisions about admissibility are made as a matter of law and as such are subject to review by an appellate court (though the review of this judgment is more lenient, more deferential, than is the review of other legal judgments, such as the interpretation of statutory, regulatory, or constitutional provisions or of the jurisdiction's authoritative common law doctrines).

ultimate admissibility decision reviewed independently.¹⁶⁴ Indeed, at least some of the criticisms for independent review of scientific evidence can be met with at least as much force as they were in *Ornelas* and *Thompson*. Thus, scientific questions can be expected to repeat, and the facts underlying them are likely to be more similar from case to case than the multi-faceted mosaic in search and seizure cases. Scientific evidence cases are more likely to produce useful precedent for future litigation than the Fourth Amendment cases.¹⁶⁵ And, certainly, similarly to the probable cause issues, even if one scientific evidence case does not squarely control another, the two decisions viewed together may usefully advance the law. This seems especially so for scientific evidence because, as many opinions already demonstrate, the nature of scientific evidence often allows for the articulation of why such evidence is, or is not, admissible.¹⁶⁶ Consequently, independent review of scientific evidenced could promote uniformity¹⁶⁷ and guide lower courts and

¹⁶⁴ Cf. Faigman, *supra* note 20, at 976. Faigman stated: "When the scientific evidence transcends the particular case, the appellate court should apply a 'hard-look' or *de novo* review to the basis for the expert opinion. When the scientific evidence involves facts specific to the particular case, the appellate court should defer to the trier of fact below." *Id.*

¹⁶⁵ See Faigman, *supra* note 131, at 573-74 (arguing that "a large component of the decision surrounding scientific evidence transcends individual cases When the preliminary facts are not case specific, logic demands little or no deference to the trial court's findings."); see also Lee, *supra* note 121, at 285 (stating that "if an appellate court can create a meaningful precedent when it reverses or otherwise sets aside a district court finding, then the standard of review should be *de novo*. In all other circumstances the 'clearly erroneous' standard should govern review."); cf. Mengler, *supra* note 15, at 452 (stating that "appellate rulings on evidence should carry little or no precedential weight . . . [b]ecause [an evidence ruling] is largely dependent on the peculiarities of the particular trial").

¹⁶⁶ Cf. Epstein, *supra* note 154, at 1161. Epstein stated:

It is often difficult for experts, outside of the legal arena, to articulate the grounds on which their judgment rests. On biological or medical questions, for example, judgment often comes from an accretion of small bits of information into a whole that more coherent than the sum of its parts.

Id.; see also Cooper, *supra* note 50, at 660 (noting that negligence is often treated as fact partly because "trial judges often will be unable to make findings of fact sufficiently detailed to communicate the full factual basis for the decision to the court of appeals").

¹⁶⁷ See Margaret G. Farrell, *Daubert v. Merrell Dow Pharmaceuticals, Inc.: Epistemology and Legal Process*, 15 CARDOZO L. REV. 2183, 2203 (1994). According to Farrell,

[*Daubert*] failed to anticipate how confidence in the system will be eroded by inconsistent future verdicts rendered in virtually identical cases on the basis of scientific evidence found valid by some gatekeeping judges but not others. If we believe that scientific truth approaches a comprehension of objective facts, it makes no sense to permit juries to derive different conclusions about matters of fact, such as whether Bendectin can cause birth defects, because one or the other must be objectively wrong. Yet, to pro-

future litigants as much as independent review does in other legal areas where it is established.

This, of course, does not mean that independent review for scientific evidence should be established. Instead, what is clear is that the ordinary rationales for abuse of discretion review do not necessarily compel that standard for scientific evidence. What should also be clear is that much needs to be learned before the review standard for scientific evidence is set, and the rule-making authority is the proper body to do the necessary study.

As this Article suggests, questions that the rule-making authority should confront include:

- (1) How often does the same scientific question repeat in different cases? How often does the evidence for that question essentially repeat? In other words, how often does basically the same *Daubert* hearing repeat?
- (2) How often do resolvable methodological issues repeat? What are they? If they were resolved by precedent, would more predictability and fewer or less costly *Daubert* hearings result?
- (3) How often during an appeal does new scientific information appear that casts doubt on the trial court determination?
- (4) Are there indications that with firmer precedents about scientific evidence some suits would not have been filed or some litigation settled more quickly?
- (5) What are the comparative institutional exposures to scientific evidence? How often do trial judges resolve such issues? How often do appellate judges now resolve such issues and how often would they with independent review?
- (6) How often is the information for the admissibility decision uniquely available to the trial court and how often does the appellate court have access to the same data for a decision?
- (7) Which institution, if either, inherently decides scientific evidence questions better, a trial court or an appellate panel?

vide uniformity, the courts would have to establish a body of precedent with regard to valid scientific methodologies in various disciplines, in effect legitimating particular scientific paradigms.

The answers to questions like these should be sought and then it can be determined what is the best appellate review standard for scientific evidence.

CONCLUSION

Under *Joiner*, the admissibility of scientific evidence is reviewed by appellate courts for an abuse of discretion. As a result, the same issue can receive different treatment in different courts. This lack of uniformity undercuts a basic goal of law and may increase the amount and complexity of litigation.

While the Supreme Court determined that precedent required the abuse of discretion standard, the rationales apart from precedent usually given to support this deferential standard of review often indicate that scientific evidence should receive independent appellate review. While the rule-making authority has the power to establish an appellate review standard for scientific evidence, the authority should first collect information to learn whether appellate courts can truly create meaningful precedent for scientific evidence as it appears they often could. If appellate courts can issue useful rules, the central legal goal of uniformity supports changing the standard of review. As a result, with scientific evidence treated more predictably than it can with an abuse of discretion standard, both judicial and litigant resources should be conserved and justice better served.