Judge Versus Jury: Who Should Decide Questions of Preliminary Facts Conditioning the Admissibility of Scientific Evidence?

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I. Introduction

Until recently, the virtually undisputed test for the admission of scientific evidence in the United States was the standard announced by the United States Court of Appeals for the District of Columbia Circuit in 1923 in *Frye v. United States.*\(^1\) According to one commentator, by the late 1970's, the *Frye* rule was the governing test in forty-five states.\(^2\) *Frye* established a widespread and rigorous test. Under *Frye*, the expert witness' opinion of the validity of the theory underlying a scientific technique is insufficient;\(^3\) the expert also must vouch, as a condition precedent to the admission of the proffered evidence, that the principle has "gained general acceptance in the particular field in which it belongs."\(^4\) Some courts toughened the *Frye* standard by requiring the proponent of the evidence to call additional expert witnesses to establish the fact of general acceptance.\(^5\) The *Frye* rule has become a formidable barrier to the admission of scientific evidence,\(^6\) and courts have ex-

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1. 293 F. 1013 (D.C. Cir. 1923).
4. 293 F. at 1014.
cluded a wide variety of scientific techniques.\textsuperscript{7}

In part because the general acceptance requirement excludes so much scientific proof, the \textit{Frye} rule has come under heavy attack.\textsuperscript{8} As early as 1954, Dean McCormick argued that the general acceptance requirement was an unduly strict standard for the admission of scientific evidence.\textsuperscript{9} He urged the courts to convert general acceptance into a test for judicial notice rather than admissibility.\textsuperscript{10} Recent commentators have continued the attack,\textsuperscript{11} and have met with some measure of success. Fifteen states\textsuperscript{12} and federal courts in two circuits,\textsuperscript{13} have repudiated \textit{Frye} or questioned its precedential value. The debate, however, has not been one-sided—both courts\textsuperscript{14} and commentators\textsuperscript{15} have defended the \textit{Frye} rule.

This Article raises an issue that has been obscured by the debate over the \textit{Frye} rule: the question of the procedure used to dete-
mine the preliminary facts that condition the admissibility of scientific evidence. Under the regime of Frye, the trial court judge determines the preliminary facts of general acceptance and validity underlying the proffered scientific evidence.\textsuperscript{17} The judge hears arguments and reviews evidence from both sides on the general acceptance and validity of the scientific technique. If the judge finds that the preliminary facts do not exist, he makes a binding determination that the evidence is inadmissible and forbids the proponent from submitting the evidence to the jury.\textsuperscript{18} In this fashion, the judge screens unreliable scientific proof from the jury.\textsuperscript{19} As jurisdictions have abandoned the Frye test and relaxed the substantive test for admitting scientific evidence, however, some courts and commentators have moved towards the view that the jury should determine the validity of the scientific theory underlying the proffered evidence.\textsuperscript{20} If the Frye rule is no longer valid, a showing of general acceptance is no longer necessary; the proponent of the evidence must show only the preliminary fact of the validity of the underlying scientific theory. In the parlance of preliminary factfinding, the issue of a theory’s validity is a question of conditional relevance, in which the judge’s limited role is to determine whether, as a matter of law, the proponent has presented evidence with sufficient probative value to support a rational jury finding that the fact exists. The jury then determines whether the fact does exist. Some courts\textsuperscript{21} and distinguished commentators\textsuperscript{22} agree that the validity of a scientific principle is a question of conditional relevance entrusted to the jury’s final decision. Even more significantly, the Federal Rules of Evidence—rules that have been

\begin{itemize}
  \item[18.] See, e.g., Fed. R. Evid. 104(a).
\end{itemize}
adopted in twenty-four states—arguably allocate the question to the jury’s final determination.

The procedure for determining the preliminary fact of validity is important for several reasons. First, Frye may no longer be good law in more than a quarter of the states and two federal circuits. Trial judges in those jurisdictions need to know whether they should decide the preliminary fact or submit the fact to the jury for resolution. Moreover, the procedure for determining the preliminary fact of validity is closely tied to the controversy over Frye. One of the foremost rationales for the Frye rule is the assumption that lay jurors are incompetent to evaluate scientific proof critically. The Frye rule rests on the premise that most lay jurors overestimate the probative value of scientific evidence and, therefore, need the protection of a screening by the trial judge. Like the debate over Frye, the proper procedure for determining the admissibility of scientific evidence is related to the capacity of the jury. If lay jurors cannot judge the weight of scientific proof properly, entrusting them with the final determination of the validity of the underlying scientific theory is dangerous.

Finally, applying the procedure for determining the admissibility of conditionally relevant evidence to scientific proof may exacerbate some of the weaknesses in scientific proof. If a scientific principle’s validity is an issue of conditional relevance, the judge has a narrow role. Under a conditional relevance procedure, the jury de-

25. See supra notes 12-13 and accompanying text.
determines the credibility of the proponent’s foundational evidence and hears the opponent’s controverting evidence. In contrast, the judge may hear only the proponent’s evidence, accept or reject that evidence at face value, and decide only the question of law: does the evidence have sufficient probative value to support a rational jury finding that the principle is valid? The application of this procedure to scientific evidence is troublesome. The judge’s ability to hear only one side of the scientific dispute is dangerous. Some scientific techniques such as sound spectrography have latent weaknesses that can be effectively exposed only by contrary expert testimony. Certainly, a peril exists in accepting the proponent’s testimony at face value. In some cases, the proponent’s expert has built a reputation on the scientific technique and is markedly biased in favor of the technique. Forcing the judge to hear only the proponent’s testimony and to accept it at face value heightens the risk of admitting untrustworthy scientific evidence.

The thesis of this Article is that the risk is so great that, to ensure the reliability of the jury’s ultimate verdict, the trial judge should determine the preliminary fact of the validity of the theory or technique underlying the proffered scientific evidence. Part two of this Article chronicles the evolution of preliminary factfinding procedures in the United States, attempting to identify the criterion for allocating preliminary facts to the judge rather than the jury. Part three applies that criterion to scientific evidence and advances the argument that the criterion requires allocation of the preliminary fact of validity to the judge. Part four of the Article construes the Federal Rules of Evidence and reluctantly concludes,

30. People v. Chapter, 13 Cal. L. Rep. (BNA) 2479 (Cal. Super. Ct. 1973) (“In approximately eighty percent of the twenty-five earlier voiceprint cases in which such expert testimony/opinion was admitted, there was no opposing expert testimony on the issue of reliability and general acceptability by the scientific community.”). See also NATIONAL ACADEMY OF SCIENCES, ON THE THEORY AND PRACTICE OF VOICE IDENTIFICATION 49 (1979) (in “the very large proportion of trials, the only experts testifying were those called by the state”).
however, that the rules allocate the determination of validity to the jury. The Article closes, therefore, by calling for the amendment of rule 901 of the Federal Rules of Evidence.

II. PROCEDURES FOR DETERMINING THE EXISTENCE OF PRELIMINARY FACTS CONDITIONING THE ADMISSIBILITY OF EVIDENCE

When a party proffers an item of evidence—such as a document or some oral testimony—and the other party objects, the judge must decide whether to admit the evidence. The applicable rules of evidence prescribe the foundation or predicate for the admission of the evidence. If a plaintiff offers testimony about a decedent's statements, for example, the defendant may object that the evidence is incompetent hearsay. Assume that the plaintiff replies that the testimony falls within the excited utterance exception to the hearsay rule. Before the testimony could qualify under that exception, the proponent would have to lay a foundation demonstrating such facts as the declarant's nervous excitement at the time of the statement. In another case, the opponent may object to a question on the ground that the question calls for privileged information, such as an attorney-client communication. The proponent may respond that no privilege exists because both parties knew that a third party was within hearing distance at the time of the communication. The judge would have to resolve the factual question of the third party's proximity before ruling on the claim of privilege. Both examples present foundational or preliminary facts that condition the admissibility of the proffered evidence and raise the question of what procedure the judge should use to determine the existence of these facts.

32. E. IMWINKELRIED, EVIDENTIARY FOUNDATIONS 1-6 (1980).
33. See Fed. R. Evid. 801, 802.
35. Fed. R. Evid. 803(2); E. IMWINKELRIED, supra note 32, at 188.
36. See MCCORMICK'S HANDBOOK OF THE LAW OF EVIDENCE §§ 87-97 (2d ed. 1972) [hereinafter cited as MCCORMICK].
A. The Early American View

Most early American trial judges resolved unsettled procedural questions by following British norms. American judges followed this practice in fashioning preliminary factfinding procedures. The traditional English rule was that the judge determined the existence of all preliminary facts. The judge would hear the evidence on both sides, resolve any incidental questions of credibility, and make a final ruling on the existence of the foundational fact. The American courts imported the English practice and the trial judge's power to determine definitively the existence of preliminary facts became an "article of faith." This common law rule was codified in rule 8 of the Uniform Rules of Evidence, rule 11 of the Model Code of Evidence, and state statutes, such as section 2102 of the California Code of Civil Procedure of 1872. Virtually universal agreement existed that the judge was the final arbiter of preliminary fact questions. Some courts carried the common law rule to great lengths.

The Louisiana Supreme Court's decision in State v. Lee is illustrative. In Lee, all the witnesses agreed that Mack Lee was the murderer. The only question was whether the defendant was Mack Lee. The defendant called Lee's wife to testify that the defendant was not Lee. At the time of the trial, Louisiana still adhered to the

40. Id.
41. Id. at 212, 230-31.
42. Id.
43. Id. at 212.
49. See, e.g., Gorton v. Hadsell, 63 Mass. (9 Cush.) 508, 511 (1852) (judge's province includes right to resolve "any preliminary questions of fact, however intricate, the solution of which may be necessary to enable him to determine the . . . admissibility of evidence"). The United States Supreme Court subsequently sanctioned this view in Gila Valley, Globe & N. Ry. v. Hall, 232 U.S. 94 (1914).
50. 127 La. 1077, 54 So. 356 (1911).
rigid common law rule that one spouse was incompetent to testify for the other. Invoking the rule, the prosecutor objected that the witness was incompetent. The prosecutor's objection thus posed the question whether the defendant was Mack Lee; the preliminary fact conditioning the admission of Mrs. Lee's testimony coincided with the pivotal, ultimate fact in the case. The trial judge followed the normal practice, decided that the defendant was married to Mrs. Lee, and barred her testimony and the defendant was convicted.51

On appeal, the defendant argued that, if the preliminary fact coincides with the ultimate fact before the jury, the jury should determine the preliminary fact's existence.52 The appellate court brushed aside the argument and found "no reason . . . for departing from the rule that the competency of witnesses is a matter for the court, and not for the jury, to pass upon."53 Thus, Lee followed the English tradition although the ruling on the preliminary fact's existence had a dispositive impact on the jury's verdict and the outcome of the case.54

B. Criticism of the Early American View

Although the English practice was widespread in the United States, courts occasionally deviated from that practice.55 Some jurisdictions adopted the "second crack" or "humanitarian" doctrine.56 In cases involving confessions and dying declarations, these jurisdictions allowed the opponent to ask the jury to determine that the evidence was inadmissible although the judge already had decided to admit the evidence.57 The courts reasoned that these types of evidence were so damning and so potentially unreliable that the defendant deserved the additional safeguard of a second chance to attack the admissibility of the evidence.58 Under the sec-

51. See id.
52. See id.
53. Id. at 1080-81, 54 So. at 357.
54. For a discussion of Lee, see Maguire & Epstein, supra note 29, at 408-10.
57. J. Maguire, supra note 39, at 220.
ond crack doctrine, the judge performed the normal preliminary factfinding functions, but the judge’s ruling did not bind the jury.

Some critics of the traditional English practice favored a more extreme departure from the common law rule to further expand the jury’s role.69 The Jacksonians, for example, advanced political and constitutional justifications for shifting factfinding power to the jurors.60 Fearful of oppression by a powerful judiciary, the Jacksonians championed the popular election of judges.61 Their democratic beliefs also prompted them to advocate a shift of some preliminary factfinding power to the jury.62 The Jacksonians contended that the jury at least should be empowered to decide straightforward preliminary factual questions.63 To the Jacksonians, an allocation of those questions to the judge unnecessarily infringed democratic ideals.

The sixth and seventh amendments to the United States Constitution64 gave the Jacksonians an alternative, constitutional argument. Those amendments establish a right to a jury trial, entitling parties to a jury determination of facts, rather than a judicial determination.65 The amendments implement the democratic ideal by proclaiming the primacy of the jury’s role as factfinder.66 The Jacksonians argued that if a judge resolves a preliminary fact question related to the merits of the case, he necessarily deprives the parties of a jury trial.67 Musterling a small army of pejoratives, the critics charged that the unnecessary allocation of factfinding power to the judge frustrated the jury’s legitimate functions.68

59. See, e.g., Maguire & Epstein, supra note 29; Morgan, Functions of Judge and Jury in the Determination of Preliminary Questions of Fact, 43 Harv. L. Rev. 165 (1929).
60. See C. Wright & K. Graham, supra note 44, §§ 5052, at 251.
61. See id.; Round Table Discussions on the Proposed Code of Judicial Conduct, 9 San Diego L. Rev. 785, 817 (1972) (remarks of Prof. E. Wayne Thode).
62. C. Wright & K. Graham, supra note 44, § 5052, at 251.
63. Id.
64. U.S. Const. amends. VI, VII.
66. 1 D. Louisell & C. Mueller, supra note 20, § 26, at 156-57; Kaplan, supra note 27, at 993.
sonians often cited Coke's maxim, "Ad quaestionem facti non respondent judices, ad quaestionem juris non respondent juratores," to support their call for reallocating preliminary factfinding power. They advocated preservation of the jury's factfinding function by allowing the jury to determine preliminary facts that did not present technical questions beyond the jury's capability.  

C. The Response to the Criticisms of the Early American View—The Emergence of the Conditional Relevancy Doctrine

At first, only a few courts responded to these criticisms of the early American view. The Supreme Court of Maine, in Winslow v. Bailey, was one of the first courts to respond. Winslow sold a parcel of land to Bailey in exchange for Bailey's promissory note. When Bailey defaulted on the note, Winslow brought an action against Bailey to collect. Bailey defended on the theory that Winslow had fraudulently induced him to enter into the contract, alleging that Winslow had falsely told him that the land was well timbered. At trial, Bailey established that little timber grew on the land. Bailey then attempted to introduce into evidence a certificate stating that "10,000 feet of the best quality of pine timber to the acre" grew on the land. Bailey claimed that during his negotiations with Winslow, Winslow had showed him the certificate to convince him that the tract was good timber land. Winslow objected when Bailey proffered the certificate, and contended that the trial judge should determine the preliminary factual question whether Winslow had displayed the certificate during the

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69. "Judges do not answer questions of fact, jurors do not answer questions of law." See J. THAYER, A PRIMARY TREATISE ON EVIDENCE AT THE COMMON LAW 185-87 (1898); J. WIGMORE, supra note 47, § 2549, at 640.

70. See N.Y. CODE OF EVIDENCE § 104 (proposed 1982); Kaus, supra note 65, at 252.

71. 16 Me. 319 (1839). For additional discussion of Winslow, see Maguire & Epstein, supra note 29, at 395-96.

72. 16 Me. at 321.
The trial judge initially was reluctant to admit the certificate but eventually did so over Winslow's objection. The judge also instructed the jury that "if [you] were not satisfied . . . that [the certificate] had been used to induce the defendant to make the purchase . . . it would not be evidence in the case." On appeal, the state supreme court upheld the trial judge's decision. The appellate court expressed its belief that the jury could determine the simple factual question posed by Winslow's objection.

In Patton v. Bank of Lafayette, the Georgia Supreme Court reached the same result as the court in Winslow. In Patton, the plaintiff sued to collect on a promissory note, and the defendant contended that an indorsement on the note was not authentic. In his instructions to the jurors, the trial judge declared that the issue of the indorsement's authenticity was

in the first instance . . . addressed to the court. The court, having heard certain evidence relating to the question, admits this note in evidence before you; but it is still a question of fact with you whether or not you find that [the person sought to be charged with liability] did or did not endorse this paper.

Commenting on the trial judge's instruction, the appellate court stated that only slight evidence is needed to authenticate a writing and that the trial judge determines the sufficiency of the proponent's evidence.

Despite scattered decisions such as Winslow and Patton, the English practice prevailed in America well into the twentieth century. Commentators did not advance a new theory of preliminary factfinding until the 1920's. An article written in 1929 by Profes-
sor Morgan was particularly influential in developing an alternative to the traditional English rule. Much of the terminology of the modern doctrine of conditional relevancy originated with Morgan's article.

The doctrine of conditional relevancy introduced a dichotomy into preliminary factfinding procedures. The early American view was unitary and decreed that the trial judge finally resolved all preliminary facts. In contrast, Morgan's theory bifurcated the preliminary factfinding procedure. The theory posits two complementary sets of procedures—one for determining preliminary facts conditioning the competence of evidence, and a second for determining facts conditioning only the logical relevance of evidence. Figure 1 illustrates the two sets of procedures.

1. Competence

Morgan defined the concept of competence broadly. Under his theory, competence extends to every reason for excluding logically relevant evidence, including the hearsay rule, the best evidence rule, the opinion rule, and privileges. Despite differences among these rules, they all exclude probative evidence. That similarity brings all four rules within the scope of Morgan's definition of competence. Thus, at step 3 on Figure 1, if the trial judge concludes that one of these evidentiary rules applies to a particular

83. Morgan, supra note 59. As subsequent commentators have noted, Morgan's analysis is substantially identical to that of Maguire and Epstein, supra note 29. See Saltzburg, supra note 29, at 271 n.2. The Morgan article is discussed here because of the more useful analytical framework it provides.

84. See supra notes 39-54 and accompanying text.

85. See, e.g., 1 D. Louisell & C. Mueller, supra note 20, § 26, at 154; Saltzburg, supra note 29, at 272 n.3.

86. J. Maguire, supra note 39, at 229; J. Wigmore, supra note 47, § 2550, at 641; Kaus, supra note 65, at 233; Laughlin, supra note 67, at 286-87; Saltzburg, supra note 29, at 271 n.2; Note, Province of Judge and Jury in Determining Preliminary Questions of Fact in New York, 23 N.Y.U. L. Rev. 472, 473-74 (1948).

87. Morgan, supra note 59, at 165 n.2. See also Cal. Evid. Code § 405 assembly committee comment (West 1966); Kaus, supra note 65, at 233.

88. The hearsay rule, the best evidence rule, and the opinion rule exclude evidence because of doubts about the reliability of the evidence. McCormick, supra note 36, § 10, at 20. Privileges exclude evidence to foster confidential relationships. Id. § 72, at 152.
Step 1: Identify the item of proffered evidence.

Step 2: Identify the preliminary facts that condition the admissibility of the proffered evidence.

Step 3: Characterize each preliminary fact as one conditioning either the relevance or the competence of the proffered evidence.

Relevance

Step 4: The trial judge decides whether the evidence in the record is sufficient to sustain a finding that the preliminary fact exists.

Step 5: The jurors determine whether the preliminary fact exists.

Competence

Step 4: As a trier of fact, the trial judge determines whether the preliminary fact exists.

Step 5: If the preliminary fact exists and coincides with a fact on the merits, the trial judge allows the jury to resolve the factual issue independently.

Figure 1. The Procedure for Determining Preliminary Facts That Condition the Admissibility of Proffered Evidence
preliminary fact, the judge would characterize the issue as one conditioning the competence of evidence.\textsuperscript{68}

After determining that the preliminary fact question conditions the competence of the proffered evidence, the trial judge would hear foundational proof from both sides regarding the existence of the preliminary fact.\textsuperscript{69} Before the witness answers the question to which the opponent has objected, the opponent may examine the witness on voir dire outside of the jury's presence.\textsuperscript{80} After hearing the voir dire and any extrinsic evidence the opponent desires to present,\textsuperscript{81} the judge makes a final ruling on the objection\textsuperscript{82} which binds the jury. The judge does not resubmit the admissibility issue to the jury,\textsuperscript{83} and the parties may not ask the jury to redetermine admissibility.\textsuperscript{84} The judge need not instruct the jury to disregard the evidence if they should find that the preliminary fact does not exist. The judge has ruled the evidence admissible.\textsuperscript{85}

2. Conditional Logical Relevance

The second prong of Morgan's doctrine addresses conditional logical relevance, a theory that allows the judge to admit conjunctive or coordinate facts that cannot be proven simultaneously.\textsuperscript{86}

When Item A and Item B considered separately are each irrelevant in absence of proof of the other, a relevancy objection may be interposed to whichever one is offered first. But a party must start somewhere. This rules requires the proponent merely to bring forward evidence from which the truth of Item A could be found, upon the representation that evidence of Item B will be offered. Evidence of the conditionally relevant Item B can then

\begin{footnotes}
\item[89.] See supra Figure 1.
\item[90.] FED. R. EVID. 104 advisory committee note.
\item[91.] See, e.g., C. WRIGHT & K. GRAHAM, supra note 44, § 5052, at 249.
\item[93.] CAL. EVID. CODE § 405 assembly committee comment (West 1966).
\item[94.] Id.
\item[95.] Id.; see also 1 D. LOUISELL & C. MUELLER, supra note 20, § 29 (citing United States v. Herrera, 407 F. Supp. 766, 771 (N.D. Ill. 1975)).
\item[96.] N.Y. CODE OF EVIDENCE § 104(b) (proposed 1982); C. WRIGHT & K. GRAHAM, supra note 44, § 5053, at 261.
\item[97.] 1 D. LOUISELL & C. MUELLER, supra note 20, § 26, at 155; see also FED. R. EVID. 104(b); CAL. EVID. CODE § 403 (West 1966).
\end{footnotes}
be shown. The dispute as to the truth of each is ultimately for
the jury rather than the judge. But the order of proof is, as gen-
erally, for the judge.... He can decide whether to hear evi-
dence of Item A or of Item B first.... Whichever one he elects
to hear first will be admitted conditionally or, in the traditional
phraseology, de bene. If the proponent fails to make good on his
representation to offer sufficient evidence of the second item,
the evidence of the first will on motion be stricken and the jury
instructed to disregard it.98

A number of preliminary facts are typically characterized as con-
ditioning only the logical relevance of proffered evidence. For in-
stance, when the proponent proffers a document, a preliminary
fact conditioning the document's admissibility is the document's
authenticity or genuineness. The common law does not accept
physical evidence, such as documents, at face value.99 The common
law is imbued with a spirit of skepticism, and holds that documen-
tary evidence is irrelevant unless the proponent authenticates the
document.100 As the advisory committee to the Federal Rules of
Evidence asserts, if the proponent offers "a letter purporting to be
from Y ... to establish an admission by him, it has no probative
value unless [the proponent presents foundational proof that] Y
wrote or authorized it."101 The courts also have applied the con-
cept of conditional relevance to such preliminary facts as notice of
the contents of a statement,102 the chain of custody for physical
evidence,103 the identification of the speaker of an oral state-
ment,104 the accuracy of a film,105 and the authority of an agent to

98. Mr. R. Evid. 104 advisor's note, reprinted in J. Wigmore, supra note 47, § 2550, at
100. McCormick, supra note 36, § 218, at 543. See generally Morgan, supra note 59, at
170-89.
3d 290, 296-97, 154 Cal. Rptr. 717, 720 (1979); C. Wright & K. Graham, supra note 44,
§ 5054.
102. See supra note 101.
103. See, e.g., United States v. Chaplinski, 579 F.2d 373, 374-75 (5th Cir.), cert. denied,
439 U.S. 1050 (1978); United States v. Weiner, 578 F.2d 757, 772-73 (9th Cir.), cert. denied,
439 U.S. 961 (1978); see also 1 D. Louiseill & C. Mueller, supra note 20, § 31, at 116-17
(Supp. 1983).
901(b)(5).
speak for the party against whom an oral statement is offered.\textsuperscript{106} California Evidence Code § 403 contains the most detailed legislative list of preliminary facts conditioning pure logical relevance.\textsuperscript{107}

If the judge classifies the preliminary fact as one conditioning only logical relevance, the procedure for determining the preliminary fact's existence contrasts sharply with the procedure followed if the preliminary fact conditions competence. If the preliminary fact conditions the competence of the proffered evidence, the judge listens to the evidence on both sides and determines the question of the preliminary fact's existence\textsuperscript{108} and decides whether the proponent's foundational evidence is credible.\textsuperscript{109} If the preliminary fact conditions logical relevance, however, the judge's role is much narrower. The judge addresses only a question of law: whether the evidence has sufficient probative value to sustain a rational jury finding that the preliminary fact exists if the jury decides to believe the proponent's foundational evidence.\textsuperscript{110} When the fact conditions logical relevance, the jury determines the credibility of the foundational evidence.\textsuperscript{111} The judge must accept the evidence at face value and cannot inquire into the credibility of the foundational evidence\textsuperscript{112} unless the evidence is preposterous as a matter of law.\textsuperscript{113} If the proponent presents prima facie\textsuperscript{114} foundational evidence or some other foundational evidence sufficient to uphold a rational jury finding,\textsuperscript{115} the judge must admit the proffered evidence regardless of whether he thinks that the foundational proof is credible.\textsuperscript{116}

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  \item \textsuperscript{105} See, e.g., United States v. Levine, 546 F.2d 658, 668 (5th Cir. 1977); see also 1 D. Louisell & C. Mueller, supra note 20, § 31, at 116 (Supp. 1983).
  \item \textsuperscript{106} See Cal. Evid. Code § 403 assembly committee comment (West 1966).
  \item \textsuperscript{107} See id. § 403. The list includes numerous facts that other jurisdictions characterize as facts conditioning the competence of evidence. Kaus, supra note 65, at 235-45.
  \item \textsuperscript{108} See supra text accompanying notes 90-93.
  \item \textsuperscript{109} Id.
  \item \textsuperscript{110} See Fed. R. Evid. 104(b); Cal. Evid. Code § 403 (West 1966).
  \item \textsuperscript{111} Seidelson, supra note 28, at 1059.
  \item \textsuperscript{112} Morgan, supra note 59, at 182.
  \item \textsuperscript{113} Maguire & Epstein, supra note 29, at 399.
  \item \textsuperscript{114} See United States v. Enright, 579 F.2d 980, 984 (6th Cir. 1978); Maguire & Epstein, supra note 29, at 410.
  \item \textsuperscript{115} See C. Wright & K. Graham, supra note 44, § 5054, at 269.
  \item \textsuperscript{116} See United States v. 478.34 Acres of Land, 578 F.2d 156, 160 (6th Cir. 1978); 1 D. Louisell & C. Mueller, supra note 20, § 33, at 243-44; Kaus, supra note 65, at 235;
\end{itemize}
As a corollary to the limited nature of the judge’s inquiry under the conditional relevance procedure, the judge may not have to listen to evidence on both sides before ruling on the objection.\textsuperscript{117} Some statutes expressly require the judge to listen to evidence on both sides before ruling on objections, including those based entirely on logical relevance.\textsuperscript{118} The internal logic of the conditional relevance concept, however, does not require that the judge listen to the opponent’s evidence before ruling.\textsuperscript{119} The only question the judge must answer is whether the proponent’s evidence is sufficiently probative to support a permissive inference of the preliminary fact’s existence.\textsuperscript{120} Because the judge ordinarily can answer that question by considering only the proponent’s evidence, a one-sided presentation of foundational evidence is adequate.\textsuperscript{121} The opponent’s contrary foundational evidence occasionally will be so overwhelming that a rational jury could not reject it.\textsuperscript{122} In the typical case, however, the opponent’s contrary foundational evidence will merely create a question of fact to be resolved by the jury.\textsuperscript{123} Under the conditional relevance concept, the judge ordinarily can force the opponent to argue the issue before the jurors.\textsuperscript{124} Thus, when the proponent’s foundational evidence has sufficient probative value on its face, the judge will overrule the objection and admit the proffered evidence.\textsuperscript{125} The opponent can present evidence to dispute the preliminary fact later in the trial.\textsuperscript{126} Under this procedure, the opponent’s refutation evidence “bears on the weight,
not the admissibility, of [the proffered] evidence.\textsuperscript{127}

The procedures used to determine conditional relevance differ from those used to determine competence in another respect. When the judge follows the conditional relevance procedure, he assigns to the jury the task of determining the existence of the preliminary fact.\textsuperscript{128} The jury makes the determination during its deliberations. Without any guidance from the judge, some jurors might not know that they should resolve the question; consequently, the jury should be instructed on the task.\textsuperscript{129}

In summary, the conditional relevance procedures differ from the competence procedures in three noteworthy respects. First, under the conditional relevance procedure, the trial judge accepts the proponent's foundational evidence at face value. The judge resolves only whether the foundational evidence has sufficient probative value as a matter of law to support a rational jury finding of the preliminary fact's existence. Under the competence procedure, the judge determines the credibility of the foundational evidence and resolves the question of the preliminary fact's existence. Second, under the conditional relevance procedure the judge sometimes listens only to the proponent's foundational evidence before ruling. Under the competence procedure, the judge must hear the foundational evidence on both sides before ruling. Finally, the judge's ruling on a fact conditioning competence binds the jury, and the judge need not instruct the jury about the preliminary


\textsuperscript{129} See generally Seidelson, supra note 28. Under the California Code, "If the [judge] admits the proffered evidence under this section, the [judge] may, and on request shall, instruct the jury to determine whether the preliminary fact exists and to disregard the proffered evidence unless the jury finds that the preliminary fact does not exist." Cal. Evid. Code § 403(c)(1) (West 1966). The March 1969 draft of the Federal Rules of Evidence contained similar language, but the language was deleted from the 1971 draft. 1 D. Louisell & C. Mueller, supra note 20, § 26, at 159; C. Wright & K. Graham, supra note 44, § 5051, at 241-42; Seidelson, supra note 28, at 1048-50. Some commentators believe that the deletion has no effect because the deleted language merely "stated the obvious." Id. at 1053. Others have concluded that the deletion gives the judge discretion to give the instruction, see 1 D. Louisell & C. Mueller, supra note 20, § 26, at 159, or requires the judge to give the instruction only when omitting the instructions would prejudice the opposing party, see Seidelson, supra note 28, at 1055, 1070.
fact. When the fact conditions only logical relevance, the judge often will charge the jurors that they must determine the preliminary fact’s existence and disregard the proffered evidence if they find that the preliminary fact does not exist.

D. The Criterion for Allocating a Preliminary Fact to the Judge Rather Than the Jury

Although the conditional relevance concept is the dominant current view, contemporary courts and commentators disagree on many points. For example, the scope of the constitutional right to a jury trial is unsettled, and the extent to which the constitutional right limits the freedom of courts and legislatures to allocate preliminary factfinding power to the judge is unclear. In addition, commentators have assailed the concept of conditional logical relevance. Professor Ball has argued persuasively that the concept is unsound and that conditional relevance is fundamentally inconsistent with the modern understanding of logical relevance. The advocates of conditional relevance contend that, in the case of conjunctive propositions of fact, proof of one fact is wholly irrelevant without proof of the other. Ball attacks this contention by arguing that proof of either fact—even in isolation—satisfies the minimal modern standard of logical relevance. Even courts and commentators subscribing to the conditional relevance theory frequently disagree over the classification of a fact as one conditioning relevance of competence. Professor Morgan and subsequent commentators have provided useful rules of classification, but the distinction between the two prongs of the dichotomy is some-

131. See U.S. CONST. amends. VI, VII.
132. See United States v. Barletta, 652 F.2d 218, 219 (1st Cir. 1981); J. THAYER, supra note 69, at 185-97; C. WRIGHT & K. GRAHAM, supra note 44, § 5053; Morgan, supra note 59, at 186-88.
133. J. WIGMORE, supra note 47, § 2550, at 651 n.4; Ball, supra note 130, at 446-69.
134. Ball, supra note 130.
135. Id. at 446-54.
136. Id.
137. Id.
times obscure. Finally, even if the judge should determine a preliminary fact, the question remains whether the judge should resolve the issue by a preponderance of the evidence or a higher standard, such as clear and convincing evidence.

Notwithstanding the extensive disagreements, courts and commentators agree on one critical point: the question of a preliminary fact's existence should be resolved by the judge when a material risk exists that the foundational evidence will affect the jury's deliberations even if the jury determines that the preliminary fact does not exist. Courts and commentators, however, often cite the jury's ability to disregard evidence after a decision of the preliminary fact's nonexistence as a justification for allocating the preliminary fact to the jury. Technical questions may be troublesome to the jury, but lay jurors can reason and apply logic.

Assume, for example, that the proffered evidence is a document and that the preliminary fact is the document's authenticity. Suppose further that, during its deliberations, the jury decides that the letter is a forgery. Using common sense, the jury can understand readily that the letter has no probative value in the case. They naturally will follow an instruction to disregard the letter if the letter is not authentic. The risk that the letter will affect the jury's deliberations after the jurors conclude that the letter is not authentic is negligible because any rational juror will disregard a forged letter. Consequently, the trial judge safely can entrust the decision to the lay jurors. In some cases, the evidence's irrelevance may be so patent that the judge hardly needs to instruct the jury.

140. 1 J. WEINSTEIN & M. BERGER, supra note 20, ¶ 104(01).
142. 1 D. LOUISELL & C. MUELLER, supra note 20, § 26, at 157.
143. C. WRIGHT & K. GRAHAM, supra note 44, § 5054, at 266-67.
144. Laughlin, supra note 67, at 305-07; Travers, supra note 68, at 343; see also Kaplan, supra 27, at 1005.
145. 1 J. WEINSTEIN & M. BERGER, supra note 20, ¶ 104(02).
146. Travers, supra note 68, at 343.
147. Laughlin, supra note 67, at 305-07; see also Kaplan, supra note 27, at 999, 1008.
148. Travers, supra note 68, at 344.
149. CAL. EVID. CODE § 403 assembly committee comment (West 1966).
Courts and commentators, however, also frequently cite the risk that the jury will disregard the judge’s instruction as a reason to assign the preliminary fact to the judge.\textsuperscript{150} Assume, for example, that an objection is made on the basis of privilege and that the admissibility of the evidence depends on whether a third party was present during a conversation between an attorney and client. Assume further that the judge instructs the jurors that the privilege attaches and that the jurors must disregard the privileged communication during their deliberations if they find that no third party was present. A material risk exists that the jury will not disregard the communication even if it concludes that the communication was privileged.\textsuperscript{151} If testimony about the communication is presented to the jury, the jurors will have difficulty expunging the testimony from their minds.\textsuperscript{152} Although the testimony is technically inadmissible, the jurors have heard the testimony, and may be subconsciously affected.\textsuperscript{153} The judge’s instruction to disregard the evidence will be ineffective;\textsuperscript{154} even a rational juror acting in good faith may not be able to honor the instruction.\textsuperscript{155} The impact of the testimony probably will color the jury’s deliberations.\textsuperscript{156}

Even the most ardent proponents of the conditional relevance concept recognize this consideration as a legitimate basis for committing a preliminary fact to the judge’s final determination. Professor Morgan acknowledged that, in dividing factfinding responsibility between the judge and the jury, a critical factor is whether the jury can realistically disregard the proffered evidence after finding the preliminary fact’s nonexistence.\textsuperscript{157} Morgan posited cases in which jurors acting in good faith could not ignore the

\textsuperscript{150} See, e.g., 1 D. Louisell & C. Mueller, supra note 20, § 26, at 157.
\textsuperscript{151} The privilege sometimes excludes information highly relevant to the merits of the case. McCormick, supra note 36, § 72, at 152. The exclusion of information is the price that society pays for the privilege.
\textsuperscript{152} J. Maguire, supra note 39, at 212; 1 J. Weinstein & M. Berger, supra note 20, ¶ 104[02]; Seidelson, supra note 28, at 1057.
\textsuperscript{153} Kaus, supra note 65, at 249.
\textsuperscript{154} 1 D. Louisell & C. Mueller, supra note 20, § 29, at 83 (Supp. 1983).
\textsuperscript{155} Travers, supra note 68, at 344.
\textsuperscript{156} See, e.g., United States v. James, 590 F.2d 575, 579 (5th Cir.), cert. denied, 442 U.S. 917 (1979); 1 D. Louisell & C. Mueller, supra note 20, § 29, at 81 (Supp. 1983); Laughlin, supra note 67, at 311.
\textsuperscript{157} Morgan, supra note 59, at 168-69.
foundational evidence and eliminate its effect from their deliberations. The California Evidence Code represents the most extreme implementation of the conditional relevance concept. Nevertheless, the Law Revision Commission comment to California Evidence Code § 405 recognizes that the jury’s inability to disregard proffered evidence is a sound reason for assigning to the judge the task of determining the existence of preliminary facts that condition the admission of the proffered evidence. The Commission favored assigning the fact to the judge whenever “it is unrealistic to expect a jury to perform such a feat.”


In a jurisdiction that has abandoned the Frye rule, the proponent of scientific evidence need not show that the underlying scientific principle is generally accepted. The proponent, however, must establish the validity of the underlying scientific principle or theory. The principle’s validity is as essential to the probative value of scientific evidence as the authenticity of a document is to the document’s probative worth. The logical relevance doctrine requires validation of the underlying scientific principle just as it mandates authentication of a proffered document. The validity of the underlying principle, therefore, is a preliminary fact that conditions the admissibility of the scientific evidence.

Until recently, the majority rule was that the trial judge should determine the existence of this preliminary fact. If the opponent presented contrary foundational evidence, a judge usually would

158. Id. at 168, 176.
159. Kaus, supra note 65, at 235-45.
160. CAL. EVID. CODE § 405 assembly committee comment (West 1966).
162. FED. R. EVID. 901(b)(9).
163. E. IMWINKELRIED, P. GIANNELLI, F. GILLIGAN & F. LEDERER, supra note 37, at 84-88.
164. Id.
165. E. IMWINKELRIED, supra note 32, at 92.
166. See People v. King, 266 Cal. App. 2d 437, 72 Cal. Rptr. 478 (1968); Strong, supra note 17, at 4.
hear evidence on both sides before ruling on the opponent's objection. In some cases, appellate courts held that submission of the preliminary fact of the principle's validity to the jury was incorrect. In a leading voiceprint identification case, for example, the trial judge submitted the question of the validity of sound spectrography to the jury in his final charge. The appellate court tersely commented that "[t]his is an incorrect statement of the law. . . ." The majority rule, however, has recently been questioned. In State v. Kersting, the Oregon Court of Appeals discussed the debate over the Frye rule and the procedural consequences of the Frye rule's abolition. The court posited a general reliability test that could be substituted for the Frye test. The court indicated that, if the reliability test governs, the trial judge's only task is to determine whether "a competent expert [has] testifie[d] that the scientific process in question is reliable. . . ." If the record contains such testimony, the judge admits the proffered scientific evidence. The opponent then may present refutation evidence to the jury, attacking the weight, but not the admissibility, of the evidence. Finally, "[e]ach factfinder would then be called upon to determine, in the course of its deliberation, the validity of the particular scientific process." The adoption of the Federal Rules of Evidence may accelerate the trend toward this minority view. The rules support an argument that the jury should determine the validity of the theory or principle underlying proffered scientific evidence. Rule 901 of the Federal Rules of Evidence is the key to the argument. Rule

169. Id. at 459-61, 72 Cal. Rptr. at 492-93.
170. Id. at 459, 72 Cal. Rptr. at 492.
172. Id. at 466-67, 623 P.2d at 1099.
173. Id.
174. Id.
175. Id.
176. Id. at 468-69, 623 P.2d at 1100.
177. 1 J. WEINSTEIN & M. BERGER, supra note 20, ¶ 104[13].
178. FED. R. EVID. 901.
901(a) restates the conditional relevance procedure: "The requirement of authentication or identification as a condition precedent to admissibility is satisfied by evidence sufficient to support a finding that the matter in question is what its proponent claims."  

Rule 901(b) then provides illustrations of preliminary facts governed by 901(a).  

Rule 901(b)(9) states that the proponent of evidence generated by a "process or system" must validate the process or system by "showing that the process or system produces an accurate result." The phrase "process or system" is expansive enough to include scientific instruments or techniques. Moreover, several leading commentators interpret rule 901(b)(9) as applying to indisputably scientific evidence such as computer output, electrocardiograms, electroencephalograms, radar, and statistical proof. These commentaries and Kersting require consideration of whether the judge or the jury should determine the validity of the theory or principle underlying proffered scientific evidence if the Frye rule is abolished.

This Article maintains that the preliminary fact of a theory's validity should be determined by the judge. As noted earlier, virtually all authorities agree that the trial judge should resolve preliminary fact questions if a material risk exists that the foundational evidence will affect the jury's deliberations after the jury has decided that the preliminary fact does not exist. That risk always would be present if the jury determined the validity of the scientific theory.

A. The Nature of the Foundational, Experimental Evidence Presented to Validate the Underlying Scientific Theory

The authentication of most types of evidence is an all-or-nothing situation where the proponent must either present sufficient evidence to support a finding that the matter in question is what its proponent claims or must be held to have failed to meet the burden of proof.

179. Id. 901(a).
180. See id. 901(b).
181. Id. 901(b)(9).
182. See D. Louisell & C. Mueller, supra note 20, § 522, at 142 n.44.
183. See id. n.45.
184. J. Weinstein & M. Berger, supra note 20, ¶ 901(b)(9)[01].
185. Id.
186. See D. Louisell & C. Mueller, supra note 20, § 522, at 143 n.47.
188. See supra text accompanying notes 150-60.
proposition. Generally, the two possibilities are mutually exclusive: a letter is either genuine or fake; a pistol either is or is not the weapon found at the crime scene; the voice on a tape recording either is or is not the defendant's voice. When the choices facing the jury are that stark and categorical, the jury will disregard the proffered evidence if the jury finds that the preliminary fact does not exist. If a letter is fake, the jury naturally will disregard it in deciding whether the defendant accepted the plaintiff's offer to enter into a long-term contract. Similarly, if a pistol is not the weapon found at the crime scene, the jury ordinarily will set aside the testimony about the pistol in deciding the defendant's guilt or innocence. If the existence of the preliminary fact is an absolute proposition and the jury finds that the fact does not exist, the jury's natural, common sense inclination will be to ignore the foundational testimony.

The foundational proof of a scientific principle's validity, however, differs qualitatively from the foundational evidence used to authenticate most types of conditionally relevant evidence. The validity of a scientific principle is not an absolute proposition. A scientist approaches a problem by first formulating a hypothesis about its solution, and then attempts to validate the hypothesis by conducting an experiment. The scientist tries to determine whether the hypothesis accounts for the data generated by the experiment. One type of experiment is a validity study. The purpose of a validity study is to determine the accuracy of a scientific technique—that is, whether the technique does what its proponents claim. Federal Rule of Evidence 901(b)(9), by mandating a showing "that the process or system produces an accurate result" requires a validity study.

Validity studies often reveal a margin of error. Consider the validity studies of polygraphy and sound spectrography. One of the best known articles on polygraph evidence surveys the scientific

190. Id.
192. See Giannelli, supra note 6, at 1201 n.20.
literature and reports that, in the published laboratory experiments, the accuracy of polygraph diagnoses of deception is eighty-one percent.\textsuperscript{195} Dr. Oscar Tosi's research on sound spectrography disclosed a margin of error in that scientific technique as well.\textsuperscript{196} In tests in which examiners were forced to decide whether the same voice produced two different spectrograms, the examiners made erroneous identifications in six percent of the cases.\textsuperscript{197} Although both polygraphs and sound spectrography are far from infallible, a number of courts have found these techniques sufficiently valid to be admissible.\textsuperscript{198} In these cases, the validating foundational evidence is probabilistic, rather than categorical.\textsuperscript{199} The experimental process may disclose a margin of error reflecting the percentage of cases in which a qualified, careful analyst employing the technique will reach an incorrect conclusion. The validation of a scientific theory, therefore, is not an absolute proposition. Although the experimental data is likely to reveal that the technique usually works, the technique may occasionally misfire.

Suppose that the proponent proffers evidence of a new technique for analyzing blood. The proponent's expert witness testifies that the margin of error is fifty-one percent. Use of the technique, therefore, will lead to an accurate result in less than half the cases—an accuracy level below pure chance. Assume that the judge assigns to the jury the task of determining the theory's validity. In this situation, the jurors probably will find that the technique is invalid and that the preliminary fact does not exist. The jury, however, may be unable to disregard the testimony about the scientific technique. The jurors know that the technique works sometimes; the foundational testimony indicates that the technique often works. The proponent's expert may be eminently qualified, one of the preeminent authorities in the field. The jurors may be tempted

\textsuperscript{197} Id.
to conclude that the expert's exceptional credentials compensate for the technique's margin of error. Although the jurors might find that the fifty-one percent error margin renders the technique invalid, subconsciously they might suspect that the superbly qualified expert on the stand could make the technique work. Thus, the jury's ability to disregard the evidence is doubtful, even if the technique's accuracy rate is less than the level of chance.

The doubts increase if the scientific technique in question has a high accuracy rate. Several jurisdictions admit polygraph and sound spectrography evidence, two techniques with documented accuracy rates exceeding eighty percent. The vast majority of jurisdictions, however, exclude these two techniques despite the seemingly impressive accuracy rates. If the jury is assigned the task of determining the validity of the underlying scientific principle, the jury will have to grapple with the threshold problem of defining the concept of validity. The trial judge might decide to help the jury by informing them of the accuracy rates of scientific techniques that courts in the jurisdiction have previously found unacceptable. For example, if the issue arose in a jurisdiction barring polygraph evidence, the judge might inform the jury that the state's courts have rejected the polygraph technique despite the technique's high accuracy rate. In this variation of the hypothetical, the jury may find the equally accurate blood technique invalid and yet be unable to disregard the evidence effectively. On the one hand, because the technique's accuracy rate is comparable to polygraphy—a technique excluded in the jurisdiction—the jury may feel compelled to find the blood technique invalid. On the other hand, the jury knows that the technique has an accuracy rate much higher than chance. The jurors not only know that the technique works sometimes; the jurors realize that the technique works in the overwhelming majority of cases. The jurors may be unable

200. See supra note 198 and accompanying text.
201. See supra notes 195-96.
203. Dean Wigmore, however, has cautioned against "cumber[ing]" the jury with legal definitions. J. Wigmore, supra note 47, § 2550, at 663.
204. The judge might judicially notice the accuracy rate of the scientific techniques previously excluded by the jurisdiction's courts. See Fed. R. Evid. 201(b), (g).
to banish this evidence from their minds even if they find that the preliminary fact does not exist. This difficulty is unique to the probabilistic nature of the experimental foundational evidence used to validate scientific techniques.

B. The Time and Effort the Jurors Often Spend Analyzing the Foundational Evidence Before Determining the Existence of the Preliminary Fact of the Technique's Validity

Because of its probabilistic character, the foundational evidence of a scientific technique's validity is different in both kind and degree from the categorical foundational proof typically used to authenticate other types of evidence. In the typical case, the jury must expend more time and effort to understand a scientific foundation. The expenditure strengthens the memory of the foundational evidence and increases the risk that the jurors will be unable to ignore the evidence once they conclude that the preliminary fact does not exist.

Lay jurors undoubtedly expend more energy attempting to understand scientific evidence than they do in comprehending more routine types of evidence. Scientific evidence is a type of expert testimony. The rationale for admitting expert testimony is that the expert's knowledge or skill enables the expert to draw inferences beyond a lay person's capability. Courts often assert that to be admissible, expert testimony must relate to a subject beyond the understanding of lay people. Thus, whenever a party proffers scientific evidence, the initial premise is that the evidence relates to a topic that jurors will have difficulty comprehending. Although proponents may use trial techniques, such as audiovisual aids, to simplify the scientific evidence for the jury, the proffered scientific proof will not qualify as expert evidence unless the proof relates to a subject beyond the common knowledge and experience of lay jurors. If a conscientious juror labors at understanding the scien-

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\text{205. Federal Rule of Evidence 702, governing expert testimony, refers to "scientific, technical, or other specialized knowledge." Fed. R. Evid. 702.}
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\text{206. McCormick, supra note 36, § 13.}
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\text{207. Cf. id. ("[C]ourts will admit expert opinion concerning matters about which the jurors may have general knowledge if the expert opinion would still aid their understanding of the fact issue.")}.
\]
tific foundational evidence and nevertheless concludes that the preliminary fact does not exist, that juror will have difficulty banishing the evidence from his memory. The more intently the juror attempts to grasp the meaning of the evidence, the more indelible the impression that the evidence will leave on the juror's mind.\textsuperscript{208}

The significant amount of courtroom time devoted to scientific proof compounds the risk that the juror will be unable to disregard the evidence. A routine foundation for authenticating a document may be very brief. Using lay testimony, such as the testimony of a person familiar with the purported author's handwriting style, the proponent can authenticate a document in one or two minutes.\textsuperscript{209} If the proponent resorts to scientific proof, however, laying the foundation is likely to be much more time consuming. Litigating a scientific technique's validity can consume hours of courtroom testimony and hundreds of pages of trial transcript.\textsuperscript{210} Understandably, when jurors listen to hours of foundational scientific proof, they will have difficulty ignoring the proof during their deliberations once they find that the preliminary fact does not exist.

The psychological literature on memory suggests the same conclusions. If a person processes information thoroughly, his memory of that information will be stronger.\textsuperscript{211} Although the extent of processing is not directly proportional to the difficulty of comprehension, the person's struggle to understand the information may enhance the depth of processing, and that greater depth should make the memory stronger. Similarly, increasing the temporal duration of exposure to a stimulus tends to solidify the memory of that stimulus.\textsuperscript{212} Prolonged exposure partially accounts for the

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\bibitem{208} Imwinkelried, \textit{supra} note 3, at 36.
\bibitem{211} I. Hunter, \textit{Memory} 24-25 (1966). For general discussions of the concept of levels of processing, see R. Klatzky, \textit{Human Memory: Structures and Processes} 21-26 (2d ed. 1980); E. Zechmeister & S. Nyberg, \textit{Human Memory: An Introduction to Research and Theory} (1982). Zechmeister and Nyberg point out that the memory of information is likely to be more durable if a person subjects the information to deeper analysis. \textit{Id.} at 254.
\bibitem{212} I. Hunter, \textit{supra} note 211, at 142; N. Spear, \textit{The Processing of Memories: Forget-
phenomenon that repetition makes the memory of information less subject to decay.\textsuperscript{213} If a conscientious juror makes an earnest effort to understand four hours of foundational scientific testimony, the juror would be virtually unable to disregard the testimony completely during the final deliberations. The juror may forget many of the details of the testimony,\textsuperscript{214} but the overall impression left by the testimony will be difficult to repress.

Combined with the probabilistic nature of a scientific foundation, the psychological difficulty of this task compels the conclusion that the trial judge should determine the validity of the theory underlying proffered scientific evidence. Even the most committed devotees of conditional relevance concede that the judge should make the final decision if an intolerable risk exists that the jury could not disregard the foundational testimony during deliberations.\textsuperscript{215} That risk exists every time the jury undertakes to determine the preliminary fact of a scientific theory's validity.


Even if the trial judge, as a matter of policy, should determine the preliminary fact of a scientific theory's validity, the judge may not be able to do so under the Federal Rules of Evidence. Rule 104 specifies the procedures for determining preliminary facts in federal courts and in the twenty-four states that have adopted the federal rules.\textsuperscript{216} The rule incorporates the relevancy-competence dichotomy. Rule 104(a) prescribes the procedure for determining facts conditioning the competence of proffered evidence: "Preliminary questions concerning the qualification of a person to be a witness, the existence of a privilege, or the admissibility of evidence

\textsuperscript{213} Chabot, Miller & Juola, The Relationship Between Repetition and Depth of Processing, 4 Memory & Cognition 677, 682 (1976); see also E. Loftus, Eyewitness Testimony 23-24 (1979).

\textsuperscript{214} I. Hunter, supra note 211, at 132.

\textsuperscript{215} See supra notes 150-60 and accompanying text.

\textsuperscript{216} See Fed. R. Evid. 104; see also supra note 23.
shall be determined by the court, subject to the provisions of subdivision (b)."\textsuperscript{217} Subdivision (b) codifies the conditional relevance procedure: "When the relevancy of evidence depends upon the fulfillment of a condition of fact, the court shall admit it upon, or subject to, the introduction of evidence sufficient to support a finding of the fulfillment of the condition."\textsuperscript{218} Whether the preliminary fact of a scientific theory’s validity falls under subdivision (a) or subdivision (b) is a complex question. Unraveling that question necessitates an analysis of Federal Rules of Evidence 901, 611, and 403.

A. Rule 901’s Allocation of Responsibility for Preliminary Factfinding

As previously noted, rule 901 may be interpreted to require that the jury determine the validity of the principle or theory underlying proffered scientific evidence.\textsuperscript{219} Two conceivable methods of undercutting that interpretation are available. First, one might argue that rule 901 does not apply to scientific evidence. A second argument is that the rule 901 requirement of a showing sufficient to support a finding of the theory’s validity establishes a floor, rather than a ceiling, leaving the trial judge free to add the requirement that the proponent establish the principle’s validity by a preponderance of the evidence.

1. Rule 901’s Applicability to Scientific Evidence

A proponent of allowing the judge, rather than the jury, to make the determination of a theory’s validity could properly charge that rule 901(b)(9) is an ambiguous, poorly conceived provision. That subsection states that, when evidence of a process or system is offered, the proponent must present foundational proof “describing a process or system used to produce a result and showing that the process or system produces an accurate result.”\textsuperscript{220} The drafters could have clarified that language by defining the provision’s relationship to the subjects of expert testimony in general and scien-

\textsuperscript{217} Fed. R. Evid. 104(a).
\textsuperscript{218} Id. 104(b).
\textsuperscript{219} See supra text accompanying notes 171-87.
\textsuperscript{220} Fed. R. Evid. 901(b)(9).
tific evidence in particular. Furthermore, the Advisory Committee's note 221 is relatively unhelpful. The Committee gives only two examples of the provision's scope, asserting that rule 901(b)(9) applies to x-rays and computers. 222 Even more disturbing, the Committee mis cites authority. The Committee lists a number of cases and articles concerning computers, 223 but on close scrutiny, none of the cited authorities supports the proposition that the validity of the computer technique is a preliminary fact for the jury's decision; the authorities deal primarily with hearsay objections to computer evidence. 224 Some of the authorities contemplate a voir dire of the proponent's witness 225 or a final finding by the judge, 226 procedures appropriate when the preliminary fact conditions the competence of the proffered evidence, rather than its logical relevance. 227

Whatever the weakness of rule 901(b)(9) may be, the most sensible interpretation is that the rule applies to the preliminary fact of a scientific principle's validity. The text and context of the rule favor this interpretation. Although the phrase "process or system," is indefinite, "process" is broad enough to include scientific processes 228 and "system" is expansive enough to encompass scientific instruments. 229 One can fault the Advisory Committee for misreading the cited authorities, but the Committee's note definitely manifests an intent that the language would apply to x-ray and

221. Id. advisory committee note.
222. Id.
224. Every decision cited in supra note 223 deals with hearsay, rather than authentication objections.
225. Freed, supra note 223, at 313.
226. Comment, supra note 223, at 72.
227. See supra text accompanying notes 90-96.
228. A "process" is "a particular method of doing something, producing something, or accomplishing a specific result." WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 1808 (P. Gove ed. 1969).
229. A "system" is any "group of devices or artificial objects . . . used for a common purpose." Id. at 2322.
computer evidence.\textsuperscript{230} X-rays and computers are indisputably scientific techniques.\textsuperscript{231} If the statute applies to those techniques, other scientific techniques must also be included within the scope of the rule. The Federal Rules of Evidence do not single out any type of scientific evidence, even the maligned polygraph,\textsuperscript{233} for special treatment. Given the examples in the Committee's note, one may reasonably infer that the drafters intend the rule to apply to any other variety of scientific evidence, including the electrocardiogram,\textsuperscript{233} electroencephalogram,\textsuperscript{234} radar,\textsuperscript{235} and statistical evidence.\textsuperscript{236}

Like the text, the context of rule 901(b)(9) suggests that the rule applies to the preliminary fact of the underlying scientific theory's validity. The context of a statute or rule sheds light on its meaning\textsuperscript{237} because the context requires consideration of other portions of the statutory or regulatory scheme.\textsuperscript{238} For that reason, rule 901(b)(9) should be construed together with the other subsections of rule 901(b). Those subsections include such logical relevance problems as the authentication of writings.\textsuperscript{239} The probative value of scientific evidence depends on the validity of the underlying theory just as a document's probative worth depends on the writing's genuineness. Rule 901(a) requires proof that proffered evidence is "what its proponent claims."\textsuperscript{240} A party offering a writing claims explicitly or implicitly that the writing is authentic. In the same fashion, a party offering scientific evidence claims explicitly

\begin{thebibliography}{99}
\bibitem{230} Fed. R. Evid. 901 advisory committee note.
\bibitem{231} See D. Bender, Computer Law: Evidence and Procedure § 5:02(2), at 5-31 (1982) (computers); A. Moenssens & F. Inbau, \textit{supra} note 198, § 11.05, at 523, § 11.12, at 557, § 17.09, at 683 (X-rays).
\bibitem{232} A. Moenssens & F. Inbau, \textit{supra} note 198, § 14.10, at 617 ("[T]he prevailing judicial attitude... is one of a general unwillingness on the part of appellate courts to approve the admissibility of Polygraph test results as trial court evidence.").
\bibitem{233} D. Loussell & C. Mueller, \textit{supra} note 20, § 522, at 142; J. Weinstein & M. Berger, \textit{supra} note 20, ¶ 901(b)(9)[01].
\bibitem{234} J. Weinstein & M. Berger, \textit{supra} note 20, ¶ 901(b)(9)[01].
\bibitem{235} Id.
\bibitem{236} D. Loussell & C. Mueller, \textit{supra} note 20, § 522, at 143.
\bibitem{237} 2A Statutes and Statutory Construction § 51.01 (C. Sands 4th ed. 1973) [hereinafter cited as Statutory Construction].
\bibitem{238} Id.
\bibitem{239} See Fed. R. Evid. 901(b)(1)-(4).
\bibitem{240} Id. 901(a).
\end{thebibliography}
or implicitly that the technique used to generate the evidence is accurate. By analogous reasoning, therefore, the proponent of scientific evidence should be required to validate the claim. Constructural rule 901(b)(9) to apply to scientific evidence ensures that it serves the same purpose and function as the other subsections of rule 901(b).

2. Rule 901(a) as a Floor Rather than a Ceiling

Assuming that rule 901(b)(9) applies to scientific evidence, we must ask whether rule 901(a) requires that the preliminary fact of the theory’s validity be treated as a fact conditioning relevance. A proponent of allowing the trial judge to determine the theory’s validity might argue that the rule sets only a floor—a minimum required showing for the admission of scientific evidence. That interpretation would permit the judge to impose additional requirements, perhaps even to insist that the proponent establish the theory’s validity by a preponderance of the evidence. A proponent of a judicial determination might attempt to bolster the argument by contending that rule 901(a) and rule 104(b) must serve different functions. Rule 104(b), setting out the conditional relevance procedure, obviously addresses the allocation of factfinding authority between the judge and the jury.241 If rule 901(a) merely restates the same procedure prescribed in rule 104(b), rule 901(a) is surplusage. The law favors giving each part of a statutory or regulatory scheme independent effect.242 Courts, therefore, ordinarily should reject the construction of a statutory or regulatory provision that renders a provision surplusage.243

As appealing as this argument may sound, it is fallacious. Initially, construing rule 901(a) as a minimum requirement is inconsistent with its language. The rule does not require at least enough “evidence . . . to support a finding that the matter in question is what its proponent claims.”244 The rule expressly says that “[t]he requirement of authentication . . . as a condition precedent to ad-

241. Id. 104(b).
242. Statutory Construction, supra note 237, § 46.06.
243. Id.
244. Fed. R. Evid. 901(a).
missibility is satisfied by" that quantum of evidence.\textsuperscript{246} Although the trial judge may impose additional requirements, such as compliance with the hearsay rule and the best evidence rule, if applicable,\textsuperscript{246} the judge may not impose additional requirements as prerequisites to authentication. With respect to the authentication doctrine, rule 901(a) creates a ceiling as well as a floor; the trial court judge can require only the quantum of proof specified in the rule to satisfy authentication, and the judge would have to overrule an authentication objection if the proponent provided that quantum. To some extent, this interpretation renders rules 104(b) and 901(a) redundant;\textsuperscript{247} but the maxim of avoiding redundant constructions is only a guide to legislative interpretation—not a positive rule of law.\textsuperscript{248} The courts should attach little weight to the maxim in this context because rules 602\textsuperscript{249} and 1008\textsuperscript{250} also are redundant when combined with rule 104(b).\textsuperscript{251} Congress obviously was not overly concerned about redundancy. Thus, any redundancy should not override the express language of rule 901(a).

Moreover, the intentional redundancy here is justified. Although most jurisdictions adhere to the conditional relevance doctrine,\textsuperscript{252} courts often disagree over the classification of particular preliminary facts.\textsuperscript{253} The courts of one state may characterize a given fact as one conditioning competence, although the same preliminary fact in another jurisdiction is said to condition logical relevance.\textsuperscript{254} In Wigmore's words, the authorities are in a sad state of varigated

\textsuperscript{245} Id. (emphasis added).
\textsuperscript{246} Id. 801-805, 1001-1008.
\textsuperscript{247} Kaplan, supra note 27, at 996.
\textsuperscript{248} Statutory Construction, supra note 237, § 46.06.
\textsuperscript{249} Fed. R. Evid. 602.
\textsuperscript{250} Id. 1008.
\textsuperscript{251} See generally 1 D. Louisell & C. Mueller, supra note 20, § 26, at 155-56.
\textsuperscript{252} See supra note 130 and accompanying text.
\textsuperscript{253} Disagreements arise over such factual classifications as whether the party heard the statement sought to be introduced as an adoptive admission, Note, supra note 86, at 476, the existence of a conspiracy when an alleged coconspirator's statements are offered against a defendant, Saltzburg, supra note 29, at 303; Seidelson, supra note 28, at 1059-79; Note, supra note 86, at 481, the authenticity of handwriting exemplars to be compared with a questioned document, Morgan, supra note 59, at 173, and whether the party heard the statement that allegedly charged the party with notice of a fact, J. Maguire, supra note 39, at 223; Maguire & Epstein, supra note 29, at 402.
\textsuperscript{254} Kaus, supra note 65.
inconsistency.\textsuperscript{255} Rule 901 may be technically redundant in light of rule 104, but the repetition of the standard in rule 901(a) serves the useful function of removing any question about the proper classification of the preliminary facts catalogued in rule 901(b).

Few reported decisions have construed rule 901(b)(9). Consequently, the argument that the statute prescribes that the fact of a scientific theory's validity must be handled as a fact conditioning logical relevance is unsettled. This interpretation, however, seems to be the more sensible reading of the rule.

B. The Possibility of Shifting Responsibility to the Judge Under Rule 611(a)

Although rule 901(b)(9) apparently commits the determination of the theory's validity to the jury, rule 611(a) may allow the judge to determine the validity at least in some cases. The rule instructs the trial court judge to “exercise reasonable control over the mode and order of interrogating witnesses and presenting evidence so as to . . . make the interrogation and presentation effective for the ascertainment of the truth. . . .”\textsuperscript{256} The argument would be that shifting the determination to the judge is a change in the order of presenting evidence. If the judge treats the fact as one conditioning logical relevance, the opponent would present controverting evidence to the jury.\textsuperscript{257} If the judge assumes the power to determine the fact, the opponent first will present the contrary evidence to the judge.\textsuperscript{258} If the judge rules the evidence admissible, the opponent may then present some or all of the same evidence to the jury to attack the validity of the scientific technique.

In this strained sense, shifting the decision from the jury to the judge is a change in the order of presenting evidence. The shift, however, involves far more than a mere change in the order of presenting evidence. On its face, rule 611(a) addresses the mode or manner in which the evidence will be presented, and the order in which the evidence will be presented. Assigning the decision to the judge addresses an entirely different set of questions: to whom will

\textsuperscript{255} See Morgan, supra note 59, at 170.
\textsuperscript{256} Fed. R. Evid. 611(a).
\textsuperscript{257} See supra text accompanying notes 119-29.
\textsuperscript{258} See supra text accompanying notes 90-96.
the foundational evidence be presented; and will the evidence be presented to the jury at all. The New York Trial Lawyers Committee on the Proposed Federal Rules of Evidence embraced this interpretation of rule 611(a). The Committee's report states that "Rule 611(a) does not attempt to change or limit the judge's authority with respect to the conduct of the trial." Rules 104 and 901 help to define the judge's authority vis-a-vis the jury. Using rule 611(a) to override rule 104 and rule 901 would change the judge's authority. Research reveals no case in which a court has relied on rule 611(a) as authority for reallocating the determination of a preliminary fact from the jury to the judge. Reliance on rule 611(a) for such authority would be a suspect expansion of the statute's intended scope.

C. The Possibility of Shifting Responsibility to the Judge Under Rule 403

If rule 611(a) does not allow the trial judge to determine the scientific theory's validity, the only remaining possibility is Federal Rule of Evidence 403. Rule 403 states that "[a]lthough 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." The broad language of rule 403 may allow the judge to determine a theory's validity. In a sense, when the judge allows the opponent to present contradictory foundational evidence to the judge rather than to the jury, the judge has excluded the foundational evidence from the jury's consideration. Moreover, the judge may justify this exclusion by citing one of the policy reasons listed in rule 403—the danger of unfair prejudice. The Advisory Committee's note to rule 403 explains that the term "prejudice" in rule 403 has a technical meaning. "Prejudice" denotes the tendency of an item of evidence

259. 3 J. WEINSTEIN & M. BERGER, supra note 20, ¶ 611[01].
260. Id.
261. Id.
263. Id.
to tempt the jury to decide the case on an improper basis.\textsuperscript{264} That interpretation of “prejudice” under rule 403 is widely accepted.\textsuperscript{265} If the jury could not effectively disregard foundational evidence after finding that the preliminary fact does not exist, the decision may be made on an improper basis. Although inadmissible, the foundational evidence still may affect the jury’s deliberations and influence the verdict.\textsuperscript{266} Hence, the judge would be excluding the foundational evidence from the jury to prevent “prejudice” in the very sense in which that term is used in rule 403.

Two powerful counterarguments, however, suggest that Rule 403 cannot be used to shift the preliminary decision from the jury to the judge. The first is that rule 403 articulates substantive evidentiary standards and is not merely a procedural rule. Rule 602, rule 901, and rule 1008, which serve procedural purposes, cross-reference rule 104 in the text or in the accompanying advisory committee note.\textsuperscript{267} The drafters manifested an intent that those rules should prescribe preliminary factfinding procedure. Neither the text of rule 403 nor the advisory committee note accompanying it cross-references rule 104. In a handful of cases, the courts’ application of rule 403 has incidentally created novel trial procedures.\textsuperscript{268} For example, some courts have invoked rule 403 as a basis for imposing time limitations on the entire trial\textsuperscript{269} or on a particular party’s case.\textsuperscript{270} In these decisions, however, the courts are excluding outright evidence offered after the time limit; they are not substituting the judge as the trier of fact to determine the credibility of evidence. Moreover, some commentators have challenged these decisions on the ground that the time limit procedure cannot “be justified by anything in the language of the rule or its legislative

\textsuperscript{264} Id. advisory committee note.
\textsuperscript{265} 2 D. LOUISELL & C. MUELLER, supra note 20, § 126, at 16-18; J. WEINSTEIN & M. BERGER, supra note 20, ¶ 403(03); 22 C. WRIGHT & K. GRAHAM, supra note 44, § 5215, at 275-81.
\textsuperscript{266} See supra text accompanying notes 208-14.
\textsuperscript{267} Fed. R. Evid. 602, 901, 1008 & advisory committee notes.
\textsuperscript{269} See, e.g., SCM Corp. v. Xerox, 77 F.R.D. 10 (D. Conn. 1977).
history." Finally, at least one court has refused to read rule 403 as authorizing a judge to deviate from procedures clearly prescribed by another statute.²⁷²

Even if rule 403 can be used as a legitimate basis for departing from the procedures specified in rules 104 and 901, rule 403 cannot be used properly to reinstate a general rule that the trial judge determines the preliminary fact of a scientific theory's validity. Trial judges typically use rule 403 as authority to balance, on an ad hoc basis, the probative value of an item of evidence against attendant dangers. Treating rule 403 as a basis for formulating a general rule applicable to an entire category of cases would put rule 403 at odds with rule 402.²⁷³ Rule 402 provides that any relevant evidence is admissible in federal cases "except as otherwise provided by the Constitution of the United States, by Act of Congress, by these rules, or by other rules prescribed by the Supreme Court pursuant to statutory authority."²⁷⁴ The list omits case law, and the legislative history of rule 402 indicates that the omission was purposeful.²⁷⁵ By omitting case law from the list, Congress expressed its intention to deprive the federal trial judge of the power to create new, general rules of evidence.²⁷⁶ Because rules 402 and 403 are part of the same statutory scheme, they must be reconciled. If trial judges could rely upon rule 403 as a source of authority to create new general evidentiary rules, rule 403 would render rule 402 irrelevant. The best harmonization of the two statutes is the interpretation that rule 403 was never intended to serve as the origin of new evidentiary rules of general applicability. Sensibly construed, the rule contemplates ad hoc decisions by the judge. Even if rule 403 has a procedural aspect, the rule cannot be strained to permit the judge routinely to remove from the jury the determination of the preliminary fact of the theory's validity. Rule 403, therefore, cannot be used to justify a shift of factfinding power to the judge in every case involving scientific evidence.

²⁷² United States v. Algie, 667 F.2d 569, 571 (6th Cir. 1982).
²⁷³ FED. R. EVID. 402.
²⁷⁴ Id.
²⁷⁵ See United States v. Grajeda, 570 F.2d 872, 874 (9th Cir. 1978); 22 C. Wright & K. Graham, supra note 44, § 5119, at 219, 222-23.
²⁷⁶ See United States v. Grajeda, 570 F.2d 872, 874 (9th Cir. 1978).
In summary, rule 104(b) and rule 901(b)(9) appear to commit to the jury the determination of a scientific theory’s validity. Although plausible statutory construction arguments exist for shifting the preliminary fact question from the jury to the judge under rules 403 and 611(a), neither rule explicitly authorizes that shift, and arguments against the shift are equally persuasive. To date, no court has interpreted either rule 403 or rule 611(a) as overriding rule 901(b)(9). As a matter of policy, the trial judge should determine the preliminary fact question. Rule 901(b)(9), however, apparently prevents the implementation of that policy. Rather than gambling on future favorable interpretations of rules 403 and 611, a sounder course of action would be to delete subsection (b)(9) from rule 901 and add legislative history specifically stating that the deletion was calculated to reinstate the orthodox rule that the trial judge determines the preliminary fact of a scientific theory’s validity.

V. CONCLUSION

At this point, the reader may suspect that this Article is a disguised apologia for the Frye test. That suspicion is understandable. The argument presented in this Article and the argument favoring the Frye rule share as a common denominator a skepticism about lay jurors’ factfinding capability. Ultimately, however, the position taken in this Article is compatible with the attacks on the Frye rule. If implemented, this Article’s recommendation for shifting factfinding power to the judge would eliminate one of the obstacles to overruling Frye.

Overruling Frye would be consistent with the assignment of the determination of the preliminary fact of a scientific theory’s validity to the judge. Although the controversies over both Frye and the allocation of the preliminary fact relate to the jury’s competence, the two issues are distinguishable. The debate over the Frye test centers on whether lay jurors can comprehend and be sufficiently skeptical of scientific evidence. The dispute over the assignment of the preliminary fact focuses on an entirely different question: If the jury decides that the preliminary fact does not exist, can the

277. Morgan, supra note 59, at 167.
278. See generally Imwinkelried, supra note 6.
jury effectively disregard the foundational evidence during its deliberations? The latter problem does not even arise until the jury has demonstrated its skepticism and independence of mind by finding that the foundational scientific evidence does not establish the preliminary fact.

In other contexts, the same juror who easily can comprehend foundational evidence may have tremendous difficulty disregarding that evidence during deliberations after determining that the preliminary fact does not exist. Consider, for example, a privilege objection that turns on whether a third party was present during an attorney's conversation with his client. No one doubts the jury's competence to decide whether a person was physically present when the attorney and client conversed; the issue of a person's presence at a particular time and place is a simple, straightforward factual question that jurors can easily resolve. Yet we routinely assign that determination of the preliminary fact to the judge. We do so because the jury, having heard the foundational proof and the contents of the proffered privileged communication, will have difficulty complying with an instruction to disregard the communication if they find that it was privileged. No self-contradiction arises by conceding the jury's ability to understand the foundational evidence and assigning the preliminary fact determination to the judge. Thus, a court convinced of the jury's competence to understand scientific evidence could nevertheless opt to assign the determination of the preliminary fact of the theory's validity to the judge.

More importantly, assigning that determination to the judge facilitates the rejection of the Frye test. Commentators have expressed growing concern about biased expert testimony. Some scientific techniques also have latent weaknesses that are best exposed by contrary expert testimony. Allocating the determination of the preliminary fact of a theory's validity to the jury aggravates these problems. On that assumption, the trial judge usually

279. See generally 1 D. Lousell & C. Mueller, supra note 20, § 28, at 173-78; 1 J. Weinstein & M. Berger, supra note 20, ¶ 104[04].
280. See supra note 279.
281. Kaplan, supra note 27, at 991.
282. See supra text accompanying note 31.
283. See supra text accompanying note 30.
would have to accept the proponent's foundational proof at face value; the opponent might be denied an opportunity to present proof to the judge that would expose the technique's latent weaknesses. If the abolition of Frye necessitated treating the fact of the theory's validity as a fact conditioning logical relevance, the undesirable procedural consequences would be an additional argument for retaining the Frye test. Contending that overruling Frye will result in an allocation of the determination of the preliminary fact to the jury, however, is a non sequitur. A court could abandon the Frye test while following the traditional practice of committing the determination of the preliminary fact to the judge. If the judge has the power to determine the validity of scientific techniques, the judge can perform a valuable function by eliminating untrustworthy scientific evidence from the deliberations of the jury.

284. See supra text accompanying note 173-74.
285. See id.