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THE "BASES" OF EXPERT TESTIMONY: THE SYLLOGISTIC STRUCTURE OF SCIENTIFIC TESTIMONY

EDWARD J. IMWINKELRIED†

Scientific testimony by expert witnesses plays an increasingly vital role in various types of complex litigation. Issues concerning the admissibility of this evidence, however, have caused considerable confusion among attorneys, judges, and legal scholars. In this Article Professor Imwinkelried posits a coherent structure for the correct analysis and application of Federal Rules 702 and 703, which control the admissibility of scientific evidence.

This analytical framework clearly distinguishes the expert's "major premise"—his "scientific, technical, and other specialized knowledge"—from his "minor premise"—the case-specific information he uses to draw his opinion or inference. Professor Imwinkelried explains that rule 702 regulates the major premise and rule 703 addresses the minor premise. This Article also illustrates how failing to recognize this distinction can lead to the misinterpretation of these rules, impede the formulation of sound policy regarding expert witnesses, and cause litigators to overlook the weaknesses in scientific testimony offered by adverse witnesses.

Modern litigators use expert testimony extensively. At the beginning of this decade the National Center for State Courts conducted a nationwide survey to determine the extent of the use of expert testimony, in particular the introduction of scientific evidence.¹ The Center found that almost half of the attorneys responding encountered scientific testimony in roughly a third of their trials.² Medical testimony is commonplace in civil personal injury actions. In these actions judges routinely permit experts to testify on such issues as causation and damages. In the criminal arena scientific proof has become "the backbone of every circumstantial evidence case."³ Prosecutors frequently call criminalists as witnesses to testify about scientific techniques ranging from fingerprinting to scanning electron microscopy.⁴ In short, as one leading commentator has

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1. *Study to Investigate Use of Scientific Evidence*, NAT'L CENTER FOR STATE COURTS REPORT, Sept., 1980, at 1.

2. *Id.*

3. Clark, *Scientific Evidence*, in THE PROSECUTOR'S DESKBOOK 542 (1971).

4. See generally P. GIANNELLI & E. IMWINKELRIED, SCIENTIFIC EVIDENCE (1986) (overview of the use of scientific evidence in criminal trials); A. MOENSSSENS, F. INBAU & J. STARRS, SCIENTIFIC EVIDENCE IN CRIMINAL CASES (3d ed. 1986) (same).

stressed, scientific testimony has "revolutionized the American lawsuit."⁵

In the final analysis we call testimony "scientific" because it is generated by the distinctive scientific process. Scientific propositions and techniques are the product of experimentation.⁶ The scientist begins by postulating an hypothesis.⁷ She next designs an experiment to verify or disprove the hypothesis⁸ and then conducts the experiment and attempts to correlate the experimental results with the hypothesis.⁹ The scientist accepts the hypothesis as a scientific truth only if the experimental results validate the hypothesis.¹⁰ The essence of the scientific process is, therefore, inductive reasoning.¹¹

Although scientific propositions are derived inductively, in the courtroom scientific testimony is ordinarily presented in a deductive, syllogistic format. The attorney calling a scientific witness typically wants the witness to apply a scientific principle to some fact in the case to illuminate the significance of that fact.¹² The witness evaluates the facts from the perspective of the general principle.¹³ Suppose, for instance, that a personal injury plaintiff calls a physician as an expert on the issue of damages. The physician will rely, at least implicitly, on a major premise. The physician's premise might be that a particular symptomatology (the presence of symptoms A, B, and C) proves the existence of brain injury D. In the words of the most famous American scientific evidence case, *Frye v. United States*,¹⁴ the major premise is "the thing from which the [expert's] deduction is made."¹⁵ The major premise is a principle,¹⁶ procedure,¹⁷ or explanatory theory¹⁸ derived by the inductive, scientific technique. The phy-

5. Carlson, *Policing the Bases of Modern Expert Testimony*, 39 VAND. L. REV. 577, 577 (1986).

6. See E. SNYDER, *HISTORY OF THE PHYSICAL SCIENCES* 21 (1969).

7. Moenssens, *Admissibility of Scientific Evidence—An Alternative to the Frye Rule*, 25 WM. & MARY L. REV. 545, 556 (1984).

8. *Id.*

9. *Id.*

10. *Id.* For another description of the scientific method, see Note, *Social Science Statistics in the Classroom: The Debate Resurfaces in McCleskey v. Kemp*, 62 NOTRE DAME L. REV. 688, 690-91 (1987).

11. See E. SNYDER, *supra* note 6, at 21.

12. An expert witness can play three different roles during a trial. R. CARLSON, E. IMWINKELRIED & E. KIONKA, *MATERIALS FOR THE STUDY OF EVIDENCE* 429 (2d ed. 1986). First, the expert can serve purely as a fact witness. *Id.* Suppose, for example, that a physician had observed scratch marks on the chest of a person she was examining. The person in question is suspected of a rape, and the rape victim testifies that she scratched the rapist's chest during the attack. The fact the marks exist is logically relevant in the case; their existence tends to corroborate the complainant's testimony identifying the defendant as the rapist. If one assumes that the physician-patient privilege does not bar the testimony, the physician could attest to the existence of the scratch marks. The physician's status as an expert certainly should not preclude the physician from giving the same factual testimony that a lay witness may give.

13. *Id.*

14. 293 F. 1013 (D.C. Cir. 1923).

15. *Id.* at 1014.

16. See, e.g., *United States v. Kilgus*, 571 F.2d 508, 510 (9th Cir. 1978); *United States v. Brown*, 557 F.2d 541, 556 (6th Cir. 1977); *United States v. Alexander*, 526 F.2d 161, 163 (8th Cir. 1975); *United States v. Baller*, 519 F.2d 463, 466 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975).

17. See, e.g., *United States v. Baller*, 519 F.2d 463, 466 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975).

18. See, e.g., *United States v. Christopher*, 833 F.2d 1296, 1299 (9th Cir. 1987); *United States v.*

sician applies that major premise to the facts of the case, namely, plaintiff's case history. The symptoms displayed by this specific plaintiff are the witness' minor premise. That case history might show that plaintiff has experienced symptoms A, B, and C. The result of applying the major to the minor premise is a conclusion, the witness' opinion on the merits of the case. In our hypothetical case, given the expert's major premise, plaintiff's case history supports the opinion that plaintiff suffers from brain injury D. Hence, the "path to the witness' final opinion"¹⁹ leads through the major and minor premises on which the expert relies. In a broad sense of the term "basis," the expert's final opinion is "based" on the major and minor premises. Those premises are the distinct, equally essential components of the syllogistic reasoning process yielding the ultimate opinion.

Unfortunately, the literature on expert testimony repeatedly blurs the distinction between these two types of premises. More often than not articles about scientific testimony are content with general references to the "bases" of the testimony. Scholarly articles commonly make sweeping mention of the "bases" of scientific testimony without differentiating between the major and minor premise components.²⁰ Articles intended primarily for practitioners frequently do likewise; again and again they employ the expression "bases" without distinguishing between the two very different kinds of bases for a scientific opinion.²¹

The thesis of this Article is that it is imperative to draw a clear line between the major and minor premise components of scientific testimony. The first section of this Article attempts to document the recurring failure of courts and commentators to differentiate between the two types of premises. The second section of the Article argues that neglecting to distinguish between the two types of premises is fraught with danger. Specifically, it argues such failure can impede the formulation of sound policy governing the admissibility of expert testimony, result in the misconstruction of the Federal Rules of Evidence on expert testimony, and cause litigators to overlook the real weaknesses in scientific testimony offered against their clients.

I. THE REPEATED FAILURE OF COMMENTATORS AND COURTS TO DISTINGUISH BETWEEN THE MAJOR AND MINOR PREMISE COMPONENTS OF SCIENTIFIC TESTIMONY

As previously observed, the literature on scientific testimony is replete with vague, undifferentiated references to the "bases" of expert testimony.²² That

Luschen, 614 F.2d 1164, 1169 n.3 (8th Cir. 1980); *United States v. Brady*, 595 F.2d 359, 362 (6th Cir.), cert. denied, 444 U.S. 862 (1979); *United States v. Brown*, 557 F.2d 541, 556 (6th Cir. 1977); *United States v. Green*, 548 F.2d 1261, 1268 (6th Cir. 1977); *United States v. Amaral*, 488 F.2d 1148, 1153 (9th Cir. 1973).

19. *United States v. R.J. Reynolds Tobacco Co.*, 416 F. Supp. 316, 325 (D.N.J. 1976).

20. *E.g.*, McElhaney, *Expert Witnesses and the Federal Rules of Evidence*, 28 MERCER L. REV. 463, 477 (1977); Nesson, *Agent Orange Meets the Blue Bus: Factfinding at the Frontier of Knowledge*, 66 B.U.L. REV. 521, 526, 531 (1986).

21. *E.g.*, McGrath, *The Art of Advocacy Continues: Expert Witnesses*, 12 THE DOCKET 1, 10 (1988); Rossi, *Modern Evidence and the Expert Witness*, LITIGATION, Fall 1985, at 18, 65.

22. See *supra* notes 20-21.

observation holds true in the case of many scholarly pieces by commentators on evidentiary policy, opinions authored by judges construing the Federal Rules of Evidence, and articles intended to give practical guidance on attacking expert testimony in the courtroom.

A. *Commentaries on Evidentiary Policy*

Many commentaries on evidentiary policy include general references to the "bases" of expert testimony,²³ using the expression to include both the major and minor premise components of scientific testimony. For example, in cataloguing the bases of expert testimony, one commentator lists "books, lectures, medical reports, patient statements, [and] consultations."²⁴ In a similar vein, while discussing the policies governing the admissibility of expert testimony, one court stated that an expert may base an opinion on "reports from the patient, . . . professional reports, treatises, and textbooks, . . . and . . . examinations, tests and diagnoses by other doctors."²⁵ Source materials such as books, lectures, treatises, and textbooks state the principles and theories which function as the expert's major premise. In contrast, statements by a patient and tests of the patient by the other doctors furnish the witness with the minor premise; they supply the data about the present case to which the expert applies the major premise.

There is one particular setting in which the use of the undifferentiated term "bases" is positively ludicrous. As Professor McElhaney has noted, courts often assert that an expert cannot "base" his opinion on another expert's opinion.²⁶ This assertion is defensible in one narrow sense; the expert on the witness stand should not be permitted to express an opinion solely because another expert outside the courtroom has expressed the same opinion.²⁷ Assume, for example, that plaintiff calls Doctor A to testify about the plaintiff's diagnosis. It would be silly to allow Doctor A to express the opinion that plaintiff has a particular disease merely because Doctor B has opined to Doctor A that plaintiff suffers from that disease. However, in the popular, broad sense of the term "bases," the assertion is nonsense. As we have seen, commentators and courts often use the term to include the expert's major premise. Does the assertion mean that a contemporary physicist cannot rely on the opinions of Albert Einstein? Does it preclude a modern psychiatrist from considering the opinions of Sigmund Freud? As Dickens' Mr. Bumble declared, "If the law supposes that, . . . the law is a[n] . . . idiot . . ."²⁸ Unless we are going to require the current generation of scientists to reinvent the wheel, we must, and of course do permit them to em-

23. See *supra* note 20.

24. Blakey, *An Introduction to the Oklahoma Evidence Code: The Thirty-Fourth Hearsay Exception*, 16 TULSA L.J. 1, 17 (1980) (quoting P. ROTHSTEIN, UNDERSTANDING THE NEW FEDERAL RULES OF EVIDENCE 82-83 (1973)).

25. Associated Indem. Corp. v. Dixon, 632 S.W.2d 833, 835 (Tex. Ct. App. 1982).

26. McElhaney, *supra* note 20, at 482-83; see also *American Key Corp. v. Cole Nat'l Corp.*, 762 F.2d 1569, 1580 (11th Cir. 1985) (expert in a federal antitrust case was not permitted to base his testimony about relevant economic market on the opinions of others).

27. See *State v. Towne*, 142 Vt. 241, 453 A.2d 1133 (1982).

28. C. DICKENS, OLIVER TWIST (London, 1838).

ploy their forerunners' theories and opinions as major premises for courtroom testimony. In this context, a broad use of the term "bases" would lead to patently absurd results.

B. *Analyses of the Construction of Federal Rules of Evidence 702 and 703*

We have seen that commentaries on evidentiary policy frequently confuse the major and minor premise components of scientific testimony. The same confusion surfaces in efforts to interpret the Federal Rules of Evidence controlling the admissibility of expert testimony. The two statutes in point are rules 702 and 703. Rule 702 reads, "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise."²⁹ Rule 703 provides,

The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to the expert at or before the hearing. If of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject, the facts or data need not be admissible in evidence.³⁰

As Section II of this Article will explain, rule 702, as properly construed, regulates the scientist's major premise. Rule 703 addresses a different topic, the sources the expert may consult in collecting the case-specific information to serve as the minor premise. Sadly, rather than demarcating the boundaries between the two statutes, the literature on scientific testimony often succeeds only in obscuring the distinction between rules 702 and 703.

One of the most publicized scientific evidence cases in recent years is *Zenith Radio Corporation v. Matsushita Electrical Industrial Co.*,³¹ a mammoth anti-trust suit against Japanese electronic products manufacturers. The litigation generated several opinions. One opinion, authored by Judge Edward Becker, was devoted entirely to the admissibility of a number of reports prepared by the plaintiff's expert economists.³² It was evident that article VII of the Federal Rules governed the admissibility of the reports. However, even after surveying the case law on rules 702 and 703, Judge Becker confessed that it was unclear "whether the inquiry should proceed under F.R.E. 702 [or] 703."³³ The courts' failure to define the relationship between rules 702 and 703 has had a predictable result; whenever the court is in doubt as to which rule governs, it is likely to cite both rules as the justification for a ruling.³⁴ Treating the rules as interchangeable in this fashion hardly helps to demarcate the boundaries between them.

29. FED. R. EVID. 702.

30. *Id.* 703.

31. 505 F. Supp. 1313 (E.D. Pa. 1980), *aff'd in part, rev'd in part*, 723 F.2d 238 (3d Cir. 1983), *cert. granted in part*, 471 U.S. 1002 (1985), *rev'd*, 475 U.S. 574 (1986).

32. *Id.* at 1318.

33. *Id.* at 1333 (Judge Becker also refers to FED. R. EVID. 403 in this context).

34. *E.g.*, *Moore v. Polish Power Inc.*, 720 S.W.2d 183, 192 (Tex. Ct. App. 1986).

Rule 703 in particular has been abused. As Section II of this article will demonstrate, the drafters of the Federal Rules of Evidence intended rule 703 to govern the content of the expert's minor premise. Commentators and courts, however, have often cited the rule in situations in which the issue was the propriety of the witness' major premise. The celebrated American scientific evidence case, *Frye v. United States*,³⁵ states that before the proponent may introduce testimony based on a novel scientific technique, the proponent must prove that the technique is already generally accepted within the relevant scientific specialty.³⁶ This doctrine is still the majority view in the United States.³⁷ Since the doctrine regulates the scientific techniques on which the witness may rely, it relates to the witness' major premise. Yet, some leading commentators analyze the viability of the *Frye* doctrine under rule 703.³⁸ Still other commentators believe that rule 703 is dispositive of the question whether polygraph evidence is generally reliable enough to be admissible.³⁹ Rule 703 has also been cited as the authority for allowing testifying doctors to refer to medical treatises and journals.⁴⁰ The reliance on rule 703 in these situations is misplaced. In each instance the expert would employ the data—the assumption of the general reliability of polygraphy or of a technique discussed in a treatise or journal—as part of her major premise. Like the commentaries noted above, many cases cite rule 703 when the rule is inapposite. One court invoked rule 703 to support its conclusion that the voice stress analysis technique was too untrustworthy to be admissible.⁴¹ In another case the court rested its rejection of the expert's use of a sun chart to determine dates based on altitude and azimuths,⁴² squarely on rule 703.⁴³ In still another case, the expert attempted to base an opinion on a "whole body of literature in the area of bio-mechanics."⁴⁴ The court allowed the testimony to be admitted and premised its permission on rule 703.⁴⁵ Numerous published opinions address the question whether an expert may rely on published scientific studies and reports, and in many of these cases, the courts analyze the question under rule 703.⁴⁶ In all of these cases the evidentiary issue

35. 293 F. 1031 (D.C. Cir. 1923); see Giannelli, *The Admissibility of Novel Scientific Evidence: Frye v. United States, a Half-Century Later*, 80 COLUM. L. REV. 1197 (1980).

36. P. GIANNELLI & E. IMWINKELRIED, *supra* note 4, § 1-5.

37. P. GIANNELLI & E. IMWINKELRIED, *supra* note 4, § 1-5.

38. M. GRAHAM, HANDBOOK OF FEDERAL EVIDENCE § 703.2 (2d ed. 1986); see also McCormick, *Scientific Evidence: Defining a New Approach to Admissibility*, 67 IOWA L. REV. 879, 888 (1982) ("rule 703 also may have some bearing on the issue of the *Frye* analysis").

39. S. SALTZBURG & K. REDDEN, FEDERAL RULES OF EVIDENCE MANUAL 633 (4th ed. 1986); Rossi, *supra* note 21, at 21.

40. S. SALTZBURG & K. REDDEN, *supra* note 39, at 669.

41. *Barrel of Fun, Inc. v. State Farm Fire & Casualty Co.*, 739 F.2d 1028, 1033 (5th Cir. 1984); see also Socha, *Excluding Plaintiff's Expert Testimony*, 29 FOR THE DEFENSE 24, 27 (Sept. 1987) (discusses FED. R. EVID. 703 which permits reasonable reliance on certain kinds of evidence).

42. *United States v. Tranowski*, 659 F.2d 750, 754 (7th Cir. 1981).

43. *Id.* at 755 n.10.

44. *Mannino v. International Mfg. Co.*, 650 F.2d 846, 853 n.3 (6th Cir. 1981).

45. *Id.* at 852-53.

46. *Osburn v. Anchor Laboratories, Inc.*, 825 F.2d 908, 915-16 (5th Cir. 1987), *cert. denied*, 108 S. Ct. 1476 (1988); *Higgins v. Kinnebrew Motors, Inc.*, 547 F.2d 1223, 1226 n.2 (5th Cir. 1977); *Nanda v. Ford Motor Co.*, 509 F.2d 213, 222 (7th Cir. 1974). The converse problem arose in *Washington v. Armstrong World Indus.*, 839 F.2d 1121 (5th Cir. 1988). The court cited rule 703 in

in dispute had nothing to do with the expert's minor premise, the specific facts of the pending case; rather, the dispute revolved around the use of a technique or information that could function as part of the major premise component of the testifying scientist's reasoning process.

C *Discussions of Trial Tactics for Attacking Scientific Testimony*

The failure to differentiate the scientist's two premises is also manifest in practitioner articles discussing effective tactics for attacking scientific testimony at trial. Most of these articles contain some excellent guidelines for cross-examining opposing experts, but these guidelines are incomplete. Many, if not most, articles focus on attacks of one of the expert's premises to the exclusion of the other.⁴⁷

At one end of the spectrum are articles illustrating attacks on the expert's minor premise while ignoring the possibility of challenging the expert's major premise.⁴⁸ These articles typically recommend that the cross-examiner concentrate the attack on vulnerable areas such as the expert's ignorance of specific facts in the case or the expert's assumption of facts that can be disproven.⁴⁹ Although these articles sometimes cite rule 702⁵⁰ they stop just short of pointing out that the cross-examiner may also question the scientific technique or theory that the expert is relying.

At the polar extreme are articles which contain detailed discussions of attacks on the witness' major premise but slight the topic of the minor premise.⁵¹ These articles occasionally make passing references to the witness' assumptions about the facts in the instant case,⁵² but their primary focus is the scientific theory that the witness is applying to those facts.⁵³ The articles frequently discuss the use of standard scientific texts to impeach the witness' testimony about the theory on which the witness relies,⁵⁴ for example, the cross-examiner may

stressing that the expert's testimony was inadmissible if it is "unsupported by medical literature." *Id.* at 1123 (citing *Viterbo v. Dow Chem. Co.*, 826 F.2d 420, 422 (5th Cir. 1982)).

47. Some comprehensive articles, however, touch on both topics. *E.g.*, Rothblatt, *Impeachment of Expert Testimony*, in 1 *FORENSIC SCIENCES* ch. 10 (C. Wecht ed. 1981); Suplee & Woodruff, *Cross-Examination of Expert Witnesses*, *PRAC. LAW.*, Jan. 1988, at 41.

48. *E.g.*, Baum, *Taking on the Opposing Expert*, *TRIAL*, Apr. 1984, at 74; Wolff, *Cross-Examination of Experts*, *TRIAL*, Mar. 1988, at 97.

49. Wolff, *supra* note 48, at 97 ("What information has he ignored that may lead to errors in his testimony?"); Baum, *supra* note 48, at 78.

50. Baum, *supra* note 48, at 78.

51. *E.g.*, Conason, *Medical Cross-Examination—Refusal to Recognize Medical Authorities*, in 143 *ADVANCED NEGLIGENCE TRIAL STRATEGY* 165; Leahy, *Examining, Cross-Examining and Impeaching Expert Witnesses*, in *THE PROSECUTOR'S DESKBOOK* 455 (2d ed. 1977); Goldstein & Sodaro, *The Use of Medical Textbooks in Cross-examination of Medical Experts*, 1955 *MED. TRIAL TECH. Q.* 161; *Evidence—Use of Learned Treatises*, 25 *DEF. L.J.* 130 (1976); *Expert Witnesses—Use of Texts and Treatises on Cross-Examination*, 19 *DEF. L.J.* 686 (1970).

52. *See, e.g.*, Leahy, *supra* note 51, at 478 (an expert may give an opinion on the basis of "knowledge and observation" if the expert first testifies to the facts underlying the opinion, but much expert testimony involves hypothetical responses to assumed facts).

53. *See* Leahy, *supra* note 51, at 479-84.

54. *See* Conason, *supra* note 51, at 169-71; Leahy, *supra* note 51, at 483 (American Psychiatric Association's manual of definitions and statistics used to impeach a defense psychiatrist); Goldstein

force the witness to concede that the author of a leading text in the field rejects the theory that the witness is employing as his major premise.

In some cases, however, as we shall see in more detail in Section II of this Article, the minor premise should be the primary point of attack.⁵⁵ A physician's major premise, the symptomatology for a particular illness, may be perfectly sound; there may even be unanimity in medical circles that the presence of symptoms A, B, and C conclusively demonstrates the existence of illness D. Assume, however, that the physician's sole source of information about the plaintiff's case history is an interview with the plaintiff, conducted on the eve of trial. Although the major premise is unassailable, the minor premise is suspect.⁵⁶ There is no corroboration for the information, the only source of information is an obviously biased person, and the expert conducted the interview when the person's bias is likely to be most pronounced. Given the source and timing of the interview, the witness' minor premise is vulnerable and may be the key weakness that the opposing attorney should assail at trial.

II. THE NEED TO DISTINGUISH BETWEEN THE MAJOR AND MINOR PREMISE COMPONENTS OF SCIENTIFIC TESTIMONY

Section I of this Article documented the widespread failure to distinguish between the major and minor premises underlying scientific testimony. The confusion exists in the literature discussing evidentiary policy, the interpretation of article VII of the Federal Rules of Evidence, and trial tactics for attacking expert testimony. This section demonstrates that it is critical to distinguish between the two types of premises in each of these settings.

A. *Evidentiary Policy*

Differentiation between the scientist's major and minor premises is vital to any discussion of the policies governing the admissibility of expert testimony. The major and minor premises pose fundamentally different problems for the policymaker.

There is a strong case for liberally allowing scientists to choose the general theories and principles comprising their major premise even when doing so necessitates reliance on hearsay sources of information such as treatises written by other scientists.⁵⁷ As one court stated, it would be "virtually impossible" for a

& Sodaro, *supra* note 51, at 181-82; *Evidence—Use of Learned Treatises*, *supra* note 51, at 137; *Expert Witnesses—Use of Texts and Treatises on Cross-Examination*, *supra* note 51, at 688.

55. See Rook, *Take the High Ground: A Practical Approach to Meeting the Insanity Defense*, in *THE PROSECUTOR'S DESKBOOK*, *supra* note 51, at 647-48.

56. See Tigar, *Handling the Expert Like an Expert: Back to Basics*, NAT'L L.J., Mar. 1, 1982, at 21, 33.

57. "Hearsay" is used here in a broad nontechnical sense. Technically an out-of-court statement constitutes hearsay only if its proponent offers it in court for the truth of the assertion. FED. R. EVID. 801(c). When the proponent calls a scientific witness who refers to another scientist's writings, the reference may not constitute hearsay in the technical sense. The proponent might offer the reference only for the limited purpose of helping the trier of fact understand the basis for the expert's opinion. The judge could admit the statement with a limiting instruction. See FED. R. EVID. 105.

scientist to avoid relying on hearsay sources of information.⁵⁸ That observation is an understatement. The reality is that "no scienti[st] . . . can possibly have firsthand knowledge of all the data comprising his field"⁵⁹ Any scientific testimony invariably rests on such sources as the expert's college textbooks and the lectures she has heard since graduation.⁶⁰ The witness has undoubtedly reviewed the published studies conducted by other scientists, and common sense dictates that the witness be permitted to rely on those works even though the witness did not participate directly in those studies.⁶¹ It would be absurd to limit the expert to scientific studies she had personally conducted. Would we require a modern accident reconstruction expert to replicate Newton's seventeenth century experiments to derive the laws of motion?⁶² Suppose that a physicist is testifying about the safety of a nuclear power plant. If the physicist contemplates relying on the works of Fermi or Oppenheimer, would we require that the physicist duplicate their research?⁶³ Imposing that requirement would effectively bar all scientific testimony. To put the matter bluntly, permitting scientific witnesses to consider the theories and studies of other researchers is an absolute necessity.⁶⁴

Moreover, the witness' choice of theories and studies to employ as a major premise should be afforded substantial deference. The scientific witness is an expert precisely because he has intensively studied the literature in that field.⁶⁵ That study may be the witness' life work.⁶⁶ The witness' sphere of expertise⁶⁷ consists of mastery of the concepts, methodologies, principles, and theories peculiar to the witness' scientific discipline.⁶⁸ The scientific witness knows "the ways of his work"⁶⁹ better than the judge or jurors. In selecting a major premise, the witness acts in his capacity as a expert. Because the scientific witness has

58. *Reeves v. Markle*, 119 Ariz. 159, 162, 579 P.2d 1382, 1385 (1978) (en banc).

59. *Dick*, *Hearsay Evidence in Expert Opinions*, 8 J. POLICE SCI. & ADMIN. 378, 382 (1980).

60. *See United States v. Williams*, 447 F.2d 1285, 1290 (5th Cir. 1971) (en banc), *cert. denied*, 405 U.S. 954 (1972); *Zenith Radio Corp. v. Matsushita Elec. Indus. Co.*, 505 F. Supp. 1313, 1322 (E.D. Pa. 1980); *Moore v. Polish Power, Inc.*, 720 S.W.2d 183, 192 (Tex. Ct. App. 1986); *see also J. SOPINKA & S. LEDERMAN*, *THE LAW OF EVIDENCE IN CIVIL CASES* 316 (1974) (Canadian courts have recognized that "because an expert's knowledge is of others not before the court" there is a hearsay basis for all expert opinion).

61. *See Wetherill v. University of Chicago*, 565 F. Supp. 1553, 1563-64 (N.D.Ill. 1983); *see also P. McWILLIAMS*, *CANADIAN CRIMINAL EVIDENCE* 241 (2d ed. 1984) (experts need not have personally conducted experiments to prove every hypothesis); *Brown v. Colm*, 11 Cal. 3d 639, 644, 522 P.2d 688, 690, 114 Cal. Rptr. 128, 130 (1974) ("there is no question that a professional physician may rely upon medical texts as the basis for his testimony").

62. *See, e.g.*, E. SNYDER, *supra* note 6, at 38-39.

63. *See, e.g.*, E. SNYDER, *supra* note 6, at 97-98.

64. *See Moore v. Grantham*, 580 S.W.2d 142, 148 (Tex. Ct. App. 1979), *rev'd on other grounds*, 599 S.W.2d 287 (Tex. 1980).

65. *FED. R. EVID.* 702.

66. *Moore v. Polish Power, Inc.*, 720 S.W.2d 183, 192 (Tex. Ct. App. 1980).

67. *See Zenith Radio Corp. v. Matsushita Elec. Indus. Co.*, 505 F. Supp. 1313, 1330 (E.D. Pa. 1980), *aff'd in part, rev'd in part*, 723 F.2d 238 (3d Cir. 1983), *cert. granted in part*, 471 U.S. 1002 (1985), *rev'd*, 475 U.S. 574 (1986).

68. *See id.* at 1328, 1364, 1370-71.

69. *Id.* at 1334 (citing Stern, *Toward a Rationale for the Use of Expert Testimony in Obscenity Litigation*, 20 CASE W. RES. L. REV. 527, 546 (1969)).

unique, superior expertise in the field, the witness' choice of a major premise warrants great respect.

When we turn to the witness' selection of information as a minor premise, a radically different picture emerges. There is no absolute necessity to permit resort to hearsay sources, there is a much less compelling case for deference to the witness' selection, and by its very nature the information serving as the minor premise poses peculiar probative dangers at trial.

Necessity certainly does not mandate allowing the expert to rely on hearsay sources to form the minor premise of her opinion. The traditional common-law view was that the expert's knowledge of the specific facts of the pending case had to take the form of personally observed facts or other independently admissible evidence.⁷⁰ Thus, a physician could rely on symptoms he had observed and medical records that fell within the business entry exception to the hearsay rule.⁷¹ If, however, a hearsay report about the particular facts of the case did not fall within a hearsay exception, the physician could not rely on that report as part of the basis for his opinion. The traditional view, which held sway for decades, required the proponent of the testimony to call the hearsay declarant as a witness at trial thus allowing the primary care physician to describe oral reports from the toxicologist and the pathologist. The traditional view forced the proponent of the physician's testimony to call the toxicologist and pathologist as well. Critics of the traditional rule argued the rule was inconvenient,⁷² a criticism which had undeniable merit. Calling the additional witnesses perhaps slightly enhanced the reliability of the testimony proffered at trial, but the critics arguably were correct in concluding that the incremental benefit usually did not justify the additional inconvenience to the witnesses and expenditure of court time. Commentators, however, debated the issue in terms of relative convenience rather than true necessity.⁷³ Barring experts from resorting to hearsay sources for their major premises would in effect render all scientific testimony inadmissible. By contrast, because hearsay sources are not necessary to provide the expert's minor premise, requiring that the information forming the minor premise be independently admissible would not have the same drastic impact.

Further, there is much less reason to defer to the scientist's choice of the information functioning as her minor premise. An expert's willingness to rely on a report about the facts in the instant case is no guarantee of the report's trustworthiness.⁷⁴ As an expert in medicine, a physician is in a better position than the judge or jury to determine that the presence of symptoms A, B, and C is the distinctive symptomatology for disease D. That determination is an exercise

70. MCCORMICK ON EVIDENCE § 15 (E. Cleary ed. 1984).

71. FED. R. EVID. 803(6).

72. See generally Rheingold, *The Basis of Medical Testimony*, 15 VAND. L. REV. 473 (1962) (criticizing as too restrictive current application of evidence rules and recommending more liberal admission of expert medical testimony).

73. See, e.g., Rheingold, *supra* note 72.

74. Note, *Hearsay Bases of Psychiatric Opinion Testimony: A Critique of Federal Rule of Evidence 703*, 51 S. CAL. L. REV. 129 (1977).

in scientific analysis.⁷⁵ Suppose, however, that symptom A is nausea, and the patient tells the physician that she experienced nausea the day before visiting the doctor's office. The patient is the plaintiff in a personal injury action, and the question is whether plaintiff truthfully described her symptoms. Does the physician's medical degree make the physician a better judge of character than the judge or jury? A physician's medical school coursework does not include any specialized training in determining credibility. The determination of the content of the expert's minor premise is predominantly an exercise in factual analysis rather than true scientific analysis.⁷⁶ To make that determination, the expert temporarily "step[s] into the shoes of the factfinder" at trial.⁷⁷ We do not assign that final determination to experts because the determination amounts to "factfinding, not the application of expertise."⁷⁸ Empowering experts to finally decide the facts constituting the minor premise would "usurp[] and derogate[] the function of the factfinder."⁷⁹

Concededly, in some exceptional cases, the expert can determine the facts constituting the minor premise more reliably than a lay trier of fact. Assume, for example, that in the last hypothetical, during the consultation the patient volunteers the fact that she experienced symptom E as well as symptoms A, B, and C. That volunteered statement may lead the physician to question the patient's assertion that she experienced symptoms A, B, and C if the existence of symptom E ordinarily precludes the presence of the other symptoms. Yet even this situation does not prove that the expert is a superior factual analyst. In this hypothetical the expert reaches a more trustworthy factual finding only because of his knowledge of another relevant major premise; he is well enough informed in his discipline's literature to realize that the presence of symptom E is an exclusionary diagnostic criterion for the other symptoms which the patient claims. The key to the physician's factfinding is largely the major premise in a syllogistic reasoning process: the presence of symptom E excludes the possibility that the patient also experienced symptoms A, B, and C; this patient experienced symptom E and therefore the patient could not have simultaneously experienced symptoms A, B, and C. Hence, even these exceptional cases bear out the generalization that a scientist's selection of principles for his major premise is entitled to more deference than the same expert's attempt to reconstruct the particular facts in the pending case. The expert's reliance on inadmissible matter in the minor premise creates probative dangers that are absent when the expert factors hearsay information into the major premise. Suppose, for instance, that an accident reconstructionist uses some of the Newtonian laws of motion as a major premise and testifies to that effect in the jury's hearing. The legitimate use of that information will be evident to the jury. It will be clear to the jurors that the

75. See *Zenith Radio Corp. v. Matsushita Elec. Indus. Co.*, 595 F. Supp. 1313, 1345 (E.D. Pa. 1980), *aff'd in part, rev'd in part*, 723 F.2d 238 (3d Cir. 1983), *cert. granted in part*, 471 U.S. 1002 (1985), *rev'd*, 475 U.S. 574 (1986).

76. *Id.* at 1342, 1345-46, 1349, 1368.

77. *Id.* at 1342.

78. *Id.* at 1368.

79. *Id.* at 1349.

expert is not, at that point in his testimony, testifying about the specific facts in this case; rather, the expert is explicitly discussing general scientific propositions. Note, however, the danger that arises as soon as the accident reconstructionist shifts topics and begins to discuss the minor premise. This discussion might include the content of an oral statement of a bystander who purportedly witnessed the collision, or a statement by the police officer who investigated the accident. There is a good possibility that neither statement would be independently admissible. If the bystander made the statement calmly long after the accident, his statement would not qualify as an excited utterance⁸⁰ or a present sense impression⁸¹ and would be inadmissible.⁸² If the police officer lacked personal knowledge of the manner in which the collision occurred, his statement also would be inadmissible.⁸³ If the statements are admissible, a problem arises because the expert's discussion of her minor premise may relate to the very adjudicative facts that the jury must determine.⁸⁴ Plaintiff's complaint might allege that defendant was negligently speeding, and the bystander's or police officer's statement might assert that the defendant exceeded the speed limit. A similar problem arises in a run-of-the-mill personal injury case in which the plaintiff presents expert medical testimony, because some of the matter included in the expert's minor premise will predictably coincide with the disputed adjudicative facts. One of those facts is usually how the accident causing the injuries occurred; the force of the impact between the two colliding cars may be one of the pivotal issues determining liability in the case. The manner of causation, however, is also often diagnostically relevant, and consequently the physician may include a hearsay description of the force of impact in his minor premise. In these cases, even if the judge admits the information only for the limited purpose of showing the basis of the expert's opinion and gives the jury an appropriate limiting instruction,⁸⁵ there is a grave risk that the jury will misuse the information as evidence on the historical merits of the case. The line drawn by the limiting instruction may be too fine for the lay jurors to understand.⁸⁶ The latest empirical research on the efficacy of limiting instructions casts doubt upon juror's ability to follow the instructions.⁸⁷ As a result, inadmissible evidence may be "insinuate[d]" into the jury's deliberations.⁸⁸ That danger is a recognized

80. See FED. R. EVID. 803(2).

81. See *id.* 803(1).

82. See *id.* 802.

83. See *id.* 602.

84. For a discussion of the difference between adjudicative and legislative facts, see FED. R. EVID. 201 advisory committee's note.

85. FED. R. EVID. 105.

86. See Carlson, *supra* note 5, at 584; see also Carlson, *Collision Course in Expert Testimony: Limitations on Affirmative Introduction of Underlying Data*, 36 U. FLA. L. REV. 234, 235 (1984) (admission of third party reports "blur[s] the distinction" between basis of opinion and substantive evidence).

87. Marcotte, *The Jury Will Disregard . . .*, 73 A.B.A. J. 34-35 (Nov. 1, 1987) (research conducted under the auspices of the American Bar Foundation); Allen, *When Jurors Are Ordered to Ignore Testimony, They Ignore the Order*, WALL ST. J., Jan. 25, 1988, § 2, at 33, col. 4 (study by American Bar Foundation and Northwestern University).

88. *Zenith Radio Corp. v. Matsushita Elec. Indus. Co.*, 505 F. Supp. 1313, 1334, 1341 (E.D.

ground for excluding evidence both at common law⁸⁹ and under the Federal Rules.⁹⁰ By contrast, the matter contained in the witness' major premise rarely relates to the controverted adjudicative facts in the case and, hence, is not subject to that ground for exclusion. This danger associated with admitting evidence constituting the minor as opposed to the major premises is a further policy reason for treating the premises differently.

In *Zenith Radio Corporation v. Matsushita Electric Industrial Co.*⁹¹ the defense sensed the difference between major and minor premises. The defense vigorously attacked plaintiff's expert reports that contained detailed discussions of the adjudicative factual disputes and purported to apply economic expertise to resolve the disputes.⁹² Plaintiff, however, offered "economic treatises, studies, and articles" in addition to those reports.⁹³ The defense did not challenge in any way the right of plaintiff's experts to rely on the treatises, studies, and articles.⁹⁴ In his opinion, Judge Becker not only noted the defense's failure to challenge this scientific literature but added the defense could not have mounted a successful challenge. Judge Becker declared it was plainly legitimate for a scientist to rely on that type of literature to support an expert opinion.⁹⁵ In sum, in the *Zenith Radio* litigation both the defense and the judge acknowledged the distinction between the major and minor premise components of the reasoning by plaintiff's experts. The recognition of that distinction facilitated an intelligent ruling on the admissibility of the challenged reports. The realization of that distinction is essential to the formulation of sound evidentiary policy governing the permissible bases of scientific testimony.⁹⁶

B. Statutory Interpretation

In *Zenith Radio*, Judge Becker bemoaned the fact that the case law has not clarified the relationship between Federal Rules of Evidence 702 and 703.⁹⁷ This Article submits that the distinction between the scientist's major and minor premises is the key to defining that relationship. Simply stated, rule 702 should be construed as governing the expert's major premise while rule 703 has a dis-

Pa. 1980), *aff'd in part, rev'd in part*, 723 F.2d 238 (3d Cir. 1983), *cert. granted in part*, 471 U.S. 1002 (1985), *rev'd*, 475 U.S. 574 (1986).

89. MCCORMICK ON EVIDENCE, *supra* note 70, § 15.

90. See FED. R. EVID. 403 advisory committee's note.

91. 505 F. Supp. 1313.

92. *Id.* at 1324-25, 1338.

93. *Id.* at 1324.

94. *Id.* at 1324, 1337.

95. *Id.*

96. See *Osburn v. Anchor Laboratories, Inc.*, 825 F.2d 908, 915 (5th Cir. 1987) ("scientific studies and case histories reported in generally accepted medical literature"), *cert. denied*, 108 S. Ct. 1476 (1988); *Manko v. United States*, 636 F. Supp. 1419, 1425-26 (W.D. Mo. 1986) (epidemiological data); *Prechtel v. Gonse*, 396 N.W.2d 837, 838-39 (Minn. Ct. App. 1986) (a study titled "The Dollar Value of Household Work"); see also *Dore, A Proposed Standard for Evaluating the Use of Epidemiological Evidence in Toxic Tort and other Personal Injury Cases*, 28 How. L.J. 677, 692-98 (only highly significant statistical evidence should be admitted).

97. *Zenith Radio*, 505 F. Supp. at 1333.

tinct mission, namely, determining the type of information that the expert may factor into his minor premise.

1. The Proper Construction of Rule 702

It is a well-settled maxim of statutory construction that an interpretation that gives independent effect to each part of a statute is preferred over an interpretation that would render part of the statute superfluous.⁹⁸ We normally presume that the legislature does not perform useless acts.⁹⁹ It would be a useless act for the legislature to include meaningless language in a statute.¹⁰⁰ For that reason, the maxim has evolved that in construing statutes, courts should attempt to find a reasonable interpretation giving effect to each part of an individual statute and each statute within a statutory scheme.¹⁰¹ In light of this maxim, the text, context, and legislative history of rule 702 point to the conclusion that the rule governs the permissible major premises for scientific testimony. The main clause of rule 702—"a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise"¹⁰²—controls the question of whether the witness qualifies as an expert. However, the application of the independent effect maxim leads to the conclusion that the rule also governs the separate issue of the permissible major premises on which the expert may rely. If the sole function of rule 702 were to prescribe the qualification standard for experts, the introductory dependent clause which allows such testimony "[i]f scientific . . . knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue"¹⁰³ would be surplusage. The only way to give effect to the introductory clause is to assume that the clause serves an additional function.¹⁰⁴ As several commentators have observed, the wording of the clause strongly suggests that its distinctive province is to regulate the subjects and theories about which the expert may testify.¹⁰⁵ The Michigan version of rule 702 makes that suggestion even stronger. The Michigan draftsmen reworded the introductory clause to read: "If the court determined that recognized scientific, technical, or other special-

98. 2A J. SUTHERLAND, STATUTES AND STATUTORY CONSTRUCTION § 46.06, at 104 (N. Singer 4th ed. 1984).

99. *Id.* at 107 n.1 (citing *Kish v. Montana State Prison*, 161 Mont. 297, 301, 505 P.2d 891, 893 (1973)).

100. *Id.* at 109 n.4 (citing *Robison v. Ray*, 637 P.2d 108, 110 (Okla. 1981)).

101. *Id.* at 108 n.1 (citing *Western Wash. Cement Masons Health & Sec. Trust Funds v. Hillis Homes, Inc.*, 26 Wash. App. 224, 232, 612 P.2d 436, 441 (1980)); see also *McCuin v. Secretary of Health and Human Services*, 817 F.2d 161, 169-71 (1st Cir. 1987) (regulation interpreted to preserve some meaning in accompanying regulation).

102. FED. R. EVID. 702.

103. *Id.*

104. See *People v. Wesley*, 198 Cal. App. 3d 519, 522, 243 Cal. Rptr. 785, 786 (1988) (a construction which renders part of the statute surplusage should be avoided).

105. See, e.g., M. GRAHAM, *supra* note 38, §§ 702.1, 702.4; 3 D. LOUISELL & C. MUELLER, *FEDERAL EVIDENCE* §§ 380, 382-83 (1979); 3 J. WEINSTEIN & M. BERGER, *WEINSTEIN'S EVIDENCE*, at ¶ 702[02]-[03]; Carlson, *supra* note 5, at 582; Harty, *The Admissibility of Expert Testimony Under the Iowa Rules of Evidence: Proffering and Resisting Expert Opinion*, 36 *DRAKE L. REV.* 345, 350 (1986-87); Romero, *The Admissibility of Scientific Evidence Under the New Mexico and Federal Rules of Evidence*, 6 *N.M.L. REV.* 187, 198 (1976); Rossi, *supra* note 21, at 18-19; Weinstein, *Improving Expert Testimony*, 20 *U. RICH. L. REV.* 473, 477-78 (1986).

ized knowledge will assist the trier of fact"¹⁰⁶ The addition of the adjective "recognized" was patently calculated to limit the types of scientific theories and techniques that the expert could employ as a major premise. The draftsmen's decision to insert that adjective in rule 702 rather than in another statute such as 703 reflects their conclusion that 702 prescribes the restrictions on the expert's major premise.

The context of rule 702 bolsters that conclusion. The context of rule 702 includes all other parts of the same statutory scheme.¹⁰⁷ As sections of the same evidence code, rules 702 and 703 are *in pari materia*¹⁰⁸ and should be construed together. The independent-effect maxim comes into play again; an ideal cumulative¹⁰⁹ construction would give each statute independent significance.¹¹⁰ On its face, rule 703 governs "[t]he facts or data in the particular case upon which an expert bases an opinion."¹¹¹ A plausible, narrow interpretation of rule 703 is that the quoted language refers only to the witness' minor premise. The independent-effect maxim cuts in favor of that narrow interpretation. As Section I of this Article noted, some courts and commentators read rule 703 broadly as applying to both the witness' major and minor premises. However, a broad interpretation of rule 703 strains the independent-effect maxim and blurs the lines between rules 702 and 703; under that interpretation, rule 703 and the introductory clause of 702 overlap as restrictions on the expert's major premise. In contrast, the narrow interpretation eliminates any possibility of duplication and conflict between the two rules.

Like its text and context, the legislative history of rule 702 supports the conclusion that the draftsmen intended the rule to regulate the content of the expert's major premise. It is true that the fourth and final paragraph of the Advisory Committee Note to rule 702 mentions the test for determining whether a witness qualifies as an expert.¹¹² The bulk of the note, however, discusses the tests to determine what subjects are proper for expert testimony. For example, the third paragraph states that rule 702 furnishes an answer to the question

106. 3 J. WEINSTEIN & M. BERGER, *supra* note 105, ¶ 702[06] (quoting MICH. R. EVID. 702).

107. See 2A J. SUTHERLAND, *supra* note 98, at ch. 51; see also *American Min. Congress v. U.S. E.P.A.*, 824 F.2d 1177 (D.C. Cir. 1987) ("[a] statutory provision cannot properly be torn from the law of which it is a part"); *United States v. Vest*, 639 F. Supp. 899 (D. Mass. 1986) (when reading text of statute, court must read not only a particular provision but other provisions that are part of its context); *Yoffie v. Marin Hosp. Dist.*, 193 Cal. App. 3d 743, 238 Cal. Rptr. 502 (1987) ("Every statute must be construed with reference to the whole system of law of which it is a part."), *aff'd*, 813 F.2d 477 (1987); *In re Marriage of Norvall*, 192 Cal. App. 3d 1047, 237 Cal. Rptr. 770 (1987) (various parts of a statutory enactment must be harmonized by considering the particular clause in context of the statutory framework as a whole); *Sonoma Subaru v. New Motor Vehicle Bd.*, 189 Cal. App. 3d 13, 234 Cal. Rptr. 226 (1987) (statute should be construed with reference to entire statutory scheme to achieve harmony among its parts); *Planned Parenthood Affiliates v. Van de Kamp*, 181 Cal. App. 3d 245, 226 Cal. Rptr. 361 (1986) (statutes are to be construed with reference to the entire system of law of which they are a part).

108. See *In re Johnson*, 787 F.2d 1179, 1181 (7th Cir. 1986); *Burk v. Unified School Dist., Wabaunsee County*, 646 F. Supp. 1557, 1563 (D. Kan. 1986).

109. See *Conover v. Dean Witter Reynolds, Inc.*, 794 F.2d 520 (9th Cir. 1986), *vacated*, 107 S. Ct. 3203 (1987).

110. *Federal Deposit Ins. Corp. v. Mallen*, 661 F. Supp. 1003, 1006 (N.D. Iowa 1987).

111. FED. R. EVID. 703.

112. FED. R. EVID. 702 advisory committee's note.

"[w]hether the situation is a proper one for the use of expert testimony."¹¹³ In addition, one of the early sentences in the fourth paragraph asserts that the rule governs "the fields of knowledge which may be drawn upon."¹¹⁴ After stating that rule 702 progressively allows resort to any helpful, specialized field of knowledge, the fourth paragraph adds that the rule "similarly" announces a liberal test for expert qualification.¹¹⁵ The use of the adverb "similarly" indicates the Committee believed rule 702 serves twin functions: the rule not only determines who qualifies as an expert but also controls the subjects on which a qualified expert may testify.

2. The Proper Construction of Rule 703

Turning to rule 703, the conclusion is that rule is designed to govern only the witness' minor premise, the information about the specific facts in the pending case. The text, context, legislative history, and purpose of the rule all are consistent with that interpretation.

The first words of the text of the rule are "[t]he facts or data in the particular case upon which an expert bases an opinion."¹¹⁶ The phrase "in the particular case" implies that the rule is limited to the information comprising the witness' minor premise. By definition, the expert's minor premise is the data in the particular case to which the expert applies the scientific theory or technique.

The context of rule 703 likewise favors a construction of the rule confined to the minor premise. As previously demonstrated, that narrow interpretation of rule 703 helps harmonize the rule with rule 702.¹¹⁷ Rules 702 and 703 are interrelated parts of the same statutory scheme.¹¹⁸ As such, they should be reconciled.¹¹⁹ Reading rule 702 as controlling the witness' major premise while applying rule 703 to the minor premise is the most complete reconciliation, since that interpretation precludes any possible conflict between the two statutes.

Although the contextual argument based on rule 702 is attractive, an even more potent argument can be constructed on the basis of rule 705. That rule reads,

The expert may testify in terms of opinion . . . and give his reasons therefor without prior disclosure of the underlying facts or data, unless

113. *Id.*

114. *Id.*

115. *Id.*

116. *Id.* 703.

117. See *McCuin v. Secretary of Health and Human Services*, 817 F.2d 161, 168 (1st Cir. 1987); *In re Johnson*, 787 F.2d 1179, 1181 (7th Cir. 1986); *Yoffie v. Marin Hosp. Dist.*, 193 Cal. App. 3d 743, 748, 238 Cal. Rptr. 502, 504 (1987); *In re Marriage of Norvall*, 192 Cal. App. 3d 1047, 1055, 237 Cal. Rptr. 770, 774 (1987); *Sonoma Subaru v. New Motor Vehicle Bd.*, 189 Cal. App. 3d 13, 20, 234 Cal. Rptr. 226, 230 (1987); *Planned Parenthood Affiliates v. Van de Kamp*, 183 Cal. App. 3d 245, 269, 226 Cal. Rptr. 361, 372 (1986); *People v. Garcia*, 187 Cal. App. 3d 887, 895, 223 Cal. Rptr. 884, 888 (1986).

118. See *Conover v. Dean Witter Reynolds, Inc.*, 794 F.2d 520, 525 (9th Cir. 1986) (Securities Act of 1933 and Securities Exchange Act of 1934 are interrelated and are to be given cumulative construction).

119. See *Federal Deposit Ins. Corp. v. Mallen*, 661 F. Supp. 1003, 1006 (N.D. Iowa 1987); *Ohio Farmers Ins. Co. v. Quin*, 198 Cal. App. 3d 1338, 1348, 244 Cal. Rptr. 359, 365 (1988).

the court requires otherwise. The expert may in any event be required to disclose the underlying facts or data on cross-examination.¹²⁰

One striking feature of rule 705 is that it uses the language "the . . . facts or data"—the same language which appears at the beginning of rule 703. When the legislature uses identical language in different statutes, the normal assumption is that the legislature used the language in the same sense in both statutes.¹²¹ On that assumption, the wording of rule 705 makes the conclusion virtually unavoidable that rule 703 is confined to the expert's minor premise. The first sentence of rule 705 allows the expert on direct examination to state an "opinion . . . and [the] reasons therefor without prior disclosure of the underlying facts or data."¹²² The rule's wording necessarily assumes that the "reasons" for the opinion differ from "the underlying facts or data"; otherwise, it would be impossible for the expert to reveal her reasons on direct examination without disclosing the underlying facts and data. The broad interpretation of rule 703, which applies the rule to the expert's major premise, would reduce rule 705 to nonsense. Other than the expert's opinion itself, the only components of the expert's reasoning process are the major and minor premises. If the expression "facts or data" in rule 703 subsumes both premises, under rule 705 it would be impossible to state the "reasons" for the opinion without revealing "the underlying facts or data." Assuming that "facts or data" include both premises and that the expert can withhold the "facts or data" on direct examination, there can be no remaining "reasons" to reveal. The only sensible result is to interpret "reasons" as referring to the witness' major premise and "facts or data" as the minor premise. Therefore, on direct examination, a physician could testify that he has diagnosed the patient as suffering from illness D and that his reason for the diagnosis is the major premise that the presence of symptoms A, B, and C is diagnostic for illness D. Under rule 705, the physician could give that direct testimony without going into any detail about his minor premise, the oral hearsay reports and medical records which led him to believe that this specific plaintiff has experienced symptoms A, B, and C.

The Advisory Committee Note to rule 703 lends further support to the contention that 703 applies only to the expert's minor premise. The first paragraph of the note illustrates the types of information that fall within the meaning of the expression "facts or data."¹²³ The paragraph lists "statements by patients and relatives, reports and opinions from nurses, technicians and other doctors, hospital records, and X rays."¹²⁴ These are the only examples furnished in the note.¹²⁵ The common characteristic of all the listed examples is that they would serve as part of the expert's minor premise. These sources of information would

120. FED. R. EVID. 705.

121. *Barnson v. United States*, 816 F.2d 549, 554 (10th Cir.), *cert. denied*, 108 S. Ct. 229 (1987); *Doctors Hosp., Inc. v. Bowen*, 811 F.2d 1448, 1452 (11th Cir. 1987); *Altaville Drug Store, Inc. v. California Employment Dev. Dept.*, 234 Cal. Rptr. 78, 82 (1987), *rev'd on other grounds*, 242 Cal. Rptr. 732, 44 Cal. 3d 231, 746 P.2d 871 (1988).

122. FED. R. EVID. 705.

123. FED. R. EVID. 703 advisory committee's note.

124. *Id.*

125. *See Zenith Radio Corp. v. Matsushita Elec. Indus. Co.*, 505 F. Supp. 1313, 1322-23 (E.D.

supply the specific facts of the particular case, but none of the listed sources constitutes a scientific theory or technique to be used to evaluate those facts. Thus, the note is still another clue suggesting that rule 703 governs only the information comprising the expert's minor premise.¹²⁶

The final clue is the indication in the note that the principal purpose of enacting rule 703 was to liberalize the permissible bases for expert opinion testimony. The first paragraph of the note avows an intent to "broaden the basis of expert opinions beyond that current in many jurisdictions."¹²⁷ The third paragraph of the note predicts that the rule will "enlarge" the permissible bases for expert opinions.¹²⁸ Seizing on these passages, commentators have universally concluded that the basic thrust of rule 703 is to relax the admissibility standards for expert testimony.¹²⁹ However, if rule 703 is construed as governing the witness' major as well as minor premise, that construction would frustrate the rule's purpose and actually make admissibility standards in expert testimony more stringent.

At the time of the adoption of the Federal Rules of Evidence, the overwhelming majority of jurisdictions subscribed to the *Frye* standard for determining the admissibility of scientific testimony.¹³⁰ *Frye* was the controlling test in at least forty-five states.¹³¹ Under the *Frye* rule, testimony based on a scientific

Pa. 1980), *aff'd in part, rev'd in part*, 723 F.2d 238 (3d Cir. 1983), *cert. granted in part*, 471 U.S. 1002 (1985), *rev'd*, 475 U.S. 574 (1986).

126. At first blush, the last paragraph of the note appears to muddy the waters. That paragraph states,

If it be feared that enlargement of permissible data may tend to break down the rules of exclusion unduly, notice should be taken that the rule requires that the facts or data "be of a type reasonably relied upon by experts in the particular field." The language would not warrant admitting in evidence the opinion of an "accidentologist" as to the point of impact in an automobile collision based on statements by bystanders, since this requirement is not satisfied.

FED. R. EVID. 703 advisory committee's note. As Judge Becker has remarked, this paragraph in the note unfortunately can lead to "confusion between Rules 702 and 703." *Zenith Radio*, 505 F. Supp. at 1327 n.14a. The proponent of a broad interpretation of rule 703 might argue that the last paragraph of the note proves that the rule also applies to the expert's major premise; the paragraph seems to generally allow the judge to exclude unreliable accident reconstruction testimony.

The paragraph, however, is susceptible to a more limited—and more sensible—interpretation. The admissibility of accident reconstruction testimony has been established beyond any cavil. *See generally* R. LIMPET, *MOTOR VEHICLE ACCIDENT RECONSTRUCTION AND CAUSE ANALYSIS* (2d ed. 1984) (aid to trial lawyer's understanding and use of accident reconstruction testimony). The paragraph cannot be read as a blanket bar to the admission of accident reconstruction testimony. A close reading of the paragraph shows that the note requires the exclusion of the expert's testimony only when the expert rests the opinion "on statements of bystanders." FED. R. EVID. 703 advisory committee's note. However, that type of statement is a classic example of information that would function as the witness' minor premise. The bystander is undoubtedly not going to make any assertions about the laws of motion; rather, the bystander will be making assertions about the speed and movement of the automobiles—the specific facts in the instant case.

127. *Id.*

128. *Id.*

129. *E.g.*, 3 D. LOUISELL & C. MUELLER, *supra* note 105, § 389, at 655, 658; 3 J. WEINSTEIN & M. BERGER, *supra* note 105, ¶ 703[03]; Blakey, *supra* note 24, at 5.

130. Imwinkelried, *The Standard for Admitting Scientific Evidence: A Critique from the Perspective of Juror Psychology*, 28 VILL. L. REV. 554, 556-57 (1983).

131. Note, *Changing the Standard for the Admissibility of Novel Scientific Evidence: State v. Williams*, 40 OHIO ST. L.J. 757, 769 (1979).

technique was admissible if the technique was generally accepted within the relevant scientific circle.¹³²

The acceptance of the testimony within the scientific circle virtually ensured the admissibility of the evidence. Against this backdrop, Congress enacted the Federal Rules, including rule 703. Rule 703 permits an expert to base an opinion on information only "[i]f [it is] of a type reasonably relied upon by experts in the particular field."¹³³ At least one line of authority holds that by virtue of the rule's use of the term "reasonably," the judge may bar an expert from relying on a type of information even when it is the customary practice within the expert's specialty to rely on that type of data, if the judge finds that reliance objectively unreasonable.¹³⁴ If that interpretation of rule 703 is correct,¹³⁵ rule 703's application to the expert's major premise could result in a more conservative test for admissibility than the *Frye* standard; even when the proponent of the testimony can prove general acceptance, the judge could second-guess the scientific community and bar the testimony.

Rule 703 will have its intended liberalizing impact only if its application is limited to the witness' minor premise. Before the adoption of the Federal Rules, many jurisdictions flatly refused to permit experts to include independently inadmissible information in their minor premise.¹³⁶ The last sentence of rule 703 states a general proposition that "the facts or data" the expert relies on "need not be admissible in evidence."¹³⁷ As the preceding paragraph noted, this general proposition is qualified by the judge's ability to preclude reliance on a particular type of information when the judge concludes that the type of information in question cannot "reasonably [be] relied upon."¹³⁸ Even with this qualification, rule 703 is a more liberal admissibility standard than the common-law test. Under the common-law standard experts could never rely on independently inadmissible matter, while rule 703 generally permits them to rely on such information except when it falls within the qualification. Hence, rule 703 represents a liberalization of admissibility standards only if the scope of the rule is confined to the expert's minor premise. The draftsmen of rule 703 unmistakably intended the rule to have a liberalizing effect. That intent strengthens interpretation of rule 703 as applying only to the information constituting the witness' minor premise.

B. *Attacking the Weight of Opposing Scientific Testimony at Trial*

We have seen that it is imperative for evidentiary policymakers and judges

132. See generally Giannelli, *supra* note 35, at 1197 (criticizing the *Frye* rule and discussing various alternatives).

133. FED. R. EVID. 703.

134. E.g., *In re "Agent Orange" Prod. Liab. Litig.*, 611 F. Supp. 1223, 1243-45 (E.D.N.Y. 1985), *aff'd*, 818 F.2d 187 (2d Cir. 1987), *cert. denied*, 108 S. Ct. 2898 (1988).

135. *Contra In re Japanese Elec. Prods. Antitrust Litig.*, 723 F.2d 238, 275-79 (3d Cir. 1983) *rev'd*, 475 U.S. 574 (1986).

136. MCCORMICK ON EVIDENCE, *supra* note 70, § 15.

137. FED. R. EVID. 703.

138. *Id.*

construing Federal Rules of Evidence 702 and 703 to distinguish between the scientific witness' major and minor premises. The distinction is helpful to policymakers formulating admissibility standards and judges applying them. Trial attorneys must also be cognizant of the distinction. Section I of this Article noted that practitioner articles on the impeachment of expert testimony usually focus on one premise to the exclusion of the other. If the litigator does likewise, she may overlook the real weakness of the opposing scientific testimony, and a weakness in the testimony may go undetected at trial. If the litigator, however, is conscious of the distinction between the major and minor premises, she may more easily identify the most effective attack on the weight of the opposing testimony. Two of the most famous scientific cases of this era are illustrative.

The first case is *United States v. Stifel*.¹³⁹ *Stifel* is the leading decision championing the admissibility of neutron activation analysis (NAA) evidence.¹⁴⁰ NAA "is one of the most sophisticated scientific techniques . . . used in" litigation.¹⁴¹ The technique is powerful because it is extremely sensitive: "Detection limits are in the microgram and nanogram range. Consequently, minute samples such as a single hair or a paint chip can be analyzed."¹⁴² In *Stifel*, a murder case, the prosecution used the NAA technique to make a minute measurement of bomb debris. The prosecution alleged defendant had sent the victim the bomb through the mail. The bomb exploded when the victim opened the package.

The bomb debris included remains of the package's mailing label, cardboard mailing tube, metal cap, and tape. An NAA expert analyzed the debris and compared the debris to similar materials found in the Proctor & Gamble storeroom where the defendant worked.¹⁴³ The expert found identical minute quantities of several chemical elements in the debris and storeroom samples. At trial the expert testified that "the mailing label and the cardboard tube fragments were of the same 'elemental composition' as their Proctor & Gamble counterparts and that 'within reasonable scientific certainty' they were 'of the same type and same manufacture.'"¹⁴⁴ At trial and on appeal, the defense attacked this testimony.¹⁴⁵

The appellate court rejected the defense's attacks. Later cases have read the appellate court's opinion as endorsing the view that "identification by Neutron Activation Analysis of small particles of physical evidence is possible and highly accurate."¹⁴⁶ However, as one of the most perceptive commentaries on the *Sti-*

139. 433 F.2d 431 (6th Cir. 1970), *cert. denied*, 401 U.S. 994 (1971). For a discussion of *Stifel* and other cases permitting NAA evidence, see A. MOENSSSENS, F. INBAU & J. STARRS, *supra* note 4, § 9.07, at 540-41.

140. A. MOENSSSENS, F. INBAU & J. STARRS, *supra* note 4, § 9.07, at 540-41.

141. P. GIANNELLI & E. IMWINKELRIED, *supra* note 4, § 11-1, at 329.

142. P. GIANNELLI & E. IMWINKELRIED, *supra* note 4, § 11-1, at 329.

143. *Stifel*, 433 F.2d at 436.

144. *Id.* at 436.

145. *Id.* at 435-36.

146. A. MOENSSSENS, F. INBAU & J. STARRS, *supra* note 4, § 9.07, at 540.

fel decision points out,¹⁴⁷ both the defense and court arguably overlooked the real weakness in the prosecution expert's testimony: the weakness in one of the expert's major premises.

The court and defense in *Stifel* correctly identified one major premise used by the prosecution expert: NAA is capable of determining the elemental composition of unknown substances. On appeal, the court analyzed that major premise.¹⁴⁸ However, as the commentator mentioned above has noted, the prosecution expert employed another line of classic syllogistic reasoning which the court and defense largely overlooked: when NAA shows that two samples have the same minute concentrations of chemical elements, the samples probably have the same source; the NAA of these samples shows that they possess identical trace concentrations of elements; and consequently, the two samples likely have the same source—namely, the storeroom to which the defendant had access.¹⁴⁹ This is the syllogistic reasoning which the defense should have challenged. Even more to the point, the defense should have challenged the major premise in this line of reasoning. The minor premise, that NAA has the capacity to determine whether two samples have the same minute quantities of chemical elements, is sound.¹⁵⁰ The major premise, however, is unproven. It may be that samples drawn from different sources can have the same elemental composition; the only way to demonstrate the validity of the major premise is to conduct empirical studies showing that samples with different origins will have different trace concentrations of elements.¹⁵¹ At trial the most effective attack on this testimony would have been questioning the major premise—for instance, forcing the prosecution expert on cross-examination to admit that there had been no empirical studies. The weakness in the expert testimony in *Stifel* was hidden in the major premise. Given the state of the empirical research at the time of *Stifel*, the expert should have been permitted to testify, at most, that the samples possessed the same minute concentrations of elements and that they *could* have a common origin or source.¹⁵² However, that fallacy evidently went undetected at trial; neither the court nor the defense carefully scrutinized the expert's major premise.

In an equally famous case, the weakness in the scientific testimony was buried in the expert's minor premise. Just as *Stifel* is a leading precedent on the admissibility of NAA, *United States v. Hiss*¹⁵³ is one of the pioneering decisions analyzing the use of expert psychiatric testimony for impeachment. The *Hiss* prosecution was a cause celebre—the prosecution of Alger Hiss on espionage charges. The star prosecution witness was Whittaker Chambers. The defense called a psychiatrist, Dr. Binger, to impeach Chambers. The defense expert tes-

147. Comment, *The Evidentiary Uses of Neutron Activation Analysis*, 59 CAL. L. REV. 997, 1070 (1971).

148. *Stifel*, 433 F.2d at 436.

149. Comment, *supra* note 147, at 1020-25.

150. A. MOENSSENS, F. INBAU & J. STARRS, *supra* note 4, § 9.05.

151. Comment, *supra* note 147, at 1023.

152. Comment, *supra* note 147, at 1024.

153. 88 F. Supp. 559 (S.D.N.Y. 1950).

tified that Chambers had a psychopathic personality disposed to making false accusations.¹⁵⁴ The expert rested his opinion, in part, on Chambers' behavior in the courtroom¹⁵⁵—such as the fact that Chambers often gazed at the ceiling during his testimony.¹⁵⁶ The prosecution was so highly publicized and the expert testimony so dramatic that "all discussions of the use of psychiatric testimony dwell at length on the *Hiss* trial, and the case has been hailed as the dawn of a new era."¹⁵⁷

Much of the debate over *Hiss* centers on the major premise that merely by observing a person's demeanor, a mental health expert can accurately determine whether the person is testifying truthfully.¹⁵⁸ The most questionable feature of the testimony in *Hiss* was the expert's minor premise; the expert included in his minor premise information gathered only by brief, courtroom observation rather than by clinical examination.¹⁵⁹ A clinical evaluation is optimum.¹⁶⁰ It is arguable that even a diagnosis based on courtroom observation assists the jury enough to pass to qualify as admissible,¹⁶¹ but the weight of a diagnosis resting on courtroom behavior is certainly doubtful.¹⁶² The courtroom is a stressful, artificial environment for the witness, and the witness' conduct in the courtroom may not typify the witness' normal behavior. Some experts flatly deny that an accurate diagnosis can be based on courtroom observation,¹⁶³ and there is a broad consensus that observing the witness at trial is an inferior basis for an expert opinion.¹⁶⁴ The weight of an opinion based on "superficial courtroom observation,"¹⁶⁵ is subject to "grave doubts."¹⁶⁶ With the cross-examination misdirected in this matter, *Hiss* is the mirror image of *Stifel*; in *Stifel*, the attack should have centered on the expert's major premise, while in *Hiss* the primary target should have been the low caliber of the information included in the expert's minor premise. In both cases, a realization of the distinction between the expert's major and minor premises might have resulted in more telling attacks on the weight of the expert testimony at trial.

III. CONCLUSION

The Judicial Conference's Committee on Rules of Practice and Procedure

154. *Id.* at 566; 3 J. WEINSTEIN & M. BERGER, *supra* note 105, ¶ 607[04].

155. *See* 3 J. WEINSTEIN & M. BERGER, *supra* note 105, ¶ 607[04].

156. *See* Slovenko, *Witnesses, Psychiatry and the Credibility of Testimony*, 19 U. FLA. L. REV. 1, 11 (1966).

157. 3 J. WEINSTEIN & M. BERGER, *supra* note 105, ¶ 607[04], at 607-72, -73.

158. 3 J. WEINSTEIN & M. BERGER, *supra* note 105, ¶ 607[04], at 607-74, -75, -76.

159. 3 J. WEINSTEIN & M. BERGER, *supra* note 105, ¶ 607[04], at 607-75.

160. Note, *Psychiatric Evaluation of the Mentally Abnormal Witness*, 59 YALE L.J. 1324, 1336 (1950).

161. *Id.*

162. *See generally* Recent Case, *Evidence—Courtroom Psychiatric Diagnosis—Valid or Invalid?*, 30 NEB. L. REV. 513 (1951) (consensus of the psychiatric profession is that courtroom observation alone is insufficient for accurate analysis).

163. *See id.* at 515 n.11.

164. *Id.* at 515-16.

165. *Id.* at 516.

166. *Id.*

released the Preliminary Draft of the Proposed Rules of Evidence for the United States District Courts and Magistrates in 1969.¹⁶⁷ That draft contained proposed rules 702 and 703,¹⁶⁸ which are virtually identical to the current rules 702 and 703. Since then, we have had almost two decades of experience working with rules 702 and 703. Yet, as Judge Becker has noted, to date the courts have failed to clarify the relationship between the two statutes.¹⁶⁹ That failure is intolerable. Scientific testimony is one of the most commonly used types of evidence in modern litigation. Article VII of the Federal Rules is supposed to furnish guidance to litigators on the use of expert testimony. Rules 702 and 703 are not only the first article VII provisions dealing with expert testimony; they are also the two most important parts of the statutory scheme for regulating the admissibility of expert testimony. Given the length of the time we have had to study article VII, the uncertainty surrounding rules 702 and 703 is inexcusable.

To end that uncertainty, this Article proposes drawing a relatively sharp line¹⁷⁰ between the major and minor premise components of expert witnesses' reasoning. On one side of the line are such questions as whether the topic is appropriate for expert testimony and whether the expert can consider scientific treatises and studies. Those questions relate to the soundness of the witness' major premise. To answer those questions the courts should look to rule 702 and the general provisions of the Federal Rules such as rules 403¹⁷¹ and 901.¹⁷²

167. COMMITTEE ON RULES OF PRACTICE AND PROCEDURE OF THE JUDICIAL CONFERENCE OF THE U.S., PRELIMINARY DRAFT OF PROPOSED RULES OF EVIDENCE FOR THE UNITED STATES DISTRICT COURTS AND MAGISTRATES (1969).

168. *Id.* at 142-43.

169. *Zenith Radio*, 505 F. Supp. 1313, 1333 (E.D. Pa. 1980), *aff'd in part, rev'd in part*, 723 F.2d 238 (3d Cir. 1983), *cert. granted in part*, 471 U.S. 1002 (1985), *rev'd*, 475 U.S. 574 (1986).

170. It would be wrong to claim that it will always be easy to determine whether information relates to an expert witness' major or minor premise. Consider, for example, *Norris v. Gatts*, 738 P.2d 344 (Alaska 1987). In *Norris* plaintiff brought suit for personal injuries he sustained when defendant's automobile struck his motorcycle. *Id.* at 346. Defendant was driving an Audi 5000, and she claimed that just before impact, her car accelerated out of control. *Id.* To support the claim the defense called an engineering expert who testified that the Audi 5000 had a design defect that could cause unanticipated, unwanted acceleration. *Id.* at 346-47. In forming his opinion the expert considered 128 consumer complaints of unwanted acceleration incidents involving the Audi 5000 that had been submitted to the National Highway Transportation Safety Administration and the Center for Auto Safety. *Id.* at 347. The court invoked rule 703 to decide whether it was proper for the expert to rely on the consumer complaints. *Id.* at 349. However, on the facts of *Norris*, is it clear that the complaints are part of the witness' minor premise?

171. FED. R. EVID. 403. Rule 403 reads, "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 of the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence." *Id.*

Rule 403 has almost universal application. Dolan, *Rule 403: The Prejudice Rule in Evidence*, 49 S. CAL. L. REV. 220, 269 (1976). The rule "apparently cuts across the entire body of the Rules," Rothstein, *Some Themes in the Proposed Federal Rules of Evidence*, 33 FED. B.J. 21, 29 (1974), and "every rule of admissibility [is] subject to the power of discretionary exclusion" under rule 403. 22 C. WRIGHT & K. GRAHAM, *FEDERAL PRACTICE AND PROCEDURE: EVIDENCE* § 5213, at 262-63 (1978). The solitary exception recognized by the courts is the admissibility of evidence of convictions qualifying under rule 609(a)(2). Imwinkelried, *The Need to Amend Federal Rule of Evidence 404(b): The Threat to the Future of the Federal Rules of Evidence*, 30 VILL. L. REV. 1465, 1480 (1985). Convictions falling within 609(a)(2) appear to be automatically admissible. *Id.* With that exception, every type of evidence—including scientific testimony satisfying rule 702—is potentially subject to exclusion under rule 403.

172. FED. R. EVID. 901. Rule 901(b)(9) states,

Issues such as whether the expert may rely on inadmissible hearsay as a source of the specific facts in the pending case fall on the other side of the line. These issues bear on the validity of the witness' minor premise. To resolve these issues the courts should turn to rule 703 and, again, to general provisions including rule 403. The major premise-minor premise distinction thus forms a superstructure for understanding article VII.

The distinction not only creates a general framework for defining the relationship between the two most important statutes in article VII; the distinction may also facilitate answering many of the narrower questions of statutory interpretation that have arisen under that article. As previously stated, before the enactment of the Federal Rules, most jurisdictions followed the *Frye* general acceptance test for determining the admissibility of scientific evidence.¹⁷³ The troublesome question is whether the *Frye* test has survived the adoption of the Federal Rules.¹⁷⁴ The advocates of the *Frye* test sometimes cite rule 703 as support for their position that *Frye* is still good law.¹⁷⁵ Rule 703 permits the judge to exclude information if practitioners of the expert's specialty cannot "reasonably" rely on that type of data.¹⁷⁶ It can be contended that "reasonably" should be construed as meaning "customarily."¹⁷⁷ So construed, rule 703 codifies *Frye*; the rule empowers the judge to require that the type of information on which the expert relies be customarily or generally accepted. However, the major premise-minor premise distinction exposes this argument as wrongminded. The *Frye* issue relates to the expert's major premise, while rule

By way of illustration only, and not by way of limitation, the following are examples of authentication or identification conforming with the requirements of this rule: . . . Process or system. Evidence describing a process or system used to produce a result and showing that the process of system produces an accurate result.

Id.

The expression "process or system" is broad enough to include scientific techniques. Quite apart from article VII, rule 901(b)(9) should be construed as requiring the proponent of scientific testimony to validate the underlying scientific technique by proving its experimental verification. See generally Imwinkelried, *Judge Versus Jury: Who Should Decide Questions of Preliminary Facts Conditioning the Admissibility of Scientific Evidence?*, 25 WM. & MARY L. REV. 577 (1984) (discussing impact of rule 901(b)(9) on admissibility of scientific evidence; concluding that preliminary fact of a theory's validity should be determined by judge).

173. P. GIANNELLI & E. IMWINKELRIED, *supra* note 4, § 1-5.

174. *E.g.*, *United States v. Williams*, 583 F.2d 1194, 1198 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); *State v. Williams*, 4 Ohio St. 3d 53, 57, 446 N.E.2d 444, 447 (1983); *cf.* *Barmeyer v. Montana Power Co.*, 202 Mont. 185, 193-94, 657 P.2d 594, 598 (1983) (sufficient foundation shown to permit expert testimony in property damage case), *overruled*, *Martel v. Montana Power Co.*, 752 P.2d 140 (Mont. 1988).

175. Address by Professor Paul Rothstein, Trial Evidence Committee of the American Bar Association Litigation Section Annual Seminar (March 4-5, 1988) (Rancho Bernardo Inn, San Diego, California). One of the topics discussed at the seminar was expert testimony. During his presentation, Professor Paul Rothstein of Georgetown University described a case in which he was recently involved. During the case one of the issues that arose was whether the judge should follow *Frye*, and one of the attorneys in the case cited rule 703 to the judge. Professor Rothstein noted that the judge seemingly relied on rule 703 in deciding to apply *Frye*. *Id.*; see also McCormick, *Scientific Evidence: Defining a New Approach to Admissibility*, 67 IOWA L. REV. 879, 888 (1982) ("nothing in Federal Rules of Evidence, their history or comments indicate an express intention to repudiate the *Frye* test").

176. FED. R. EVID. 703.

177. *In re Japanese Elec. Prods. Antitrust Litig.*, 723 F.2d 238, 276 (3d Cir. 1983), *rev'd sub. nom.* *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 575 U.S. 574 (1986).

703 governs only the content of the witness' minor premise. In this light, it is spurious to seize on "reasonably" in rule 703 as an indication that the courts should still enforce *Frye* under the regime of the Federal Rules.

Another current controversy over article VII is the issue just mentioned, namely, the meaning of "reasonably" in rule 703. Some courts equate "reasonably" with "customarily."¹⁷⁸ Other courts subscribe to the contrary view that Congress' choice of "reasonably" connotes that the trial judge can preclude an expert from relying on a type of data even when it is the customary practice of the expert's specialty to do so.¹⁷⁹ Just as the major-minor premise distinction sheds light on the *Frye* dispute, the distinction should help focus the discussion of this controversy. In the final analysis, the policy question is whether the courts should, in effect, delegate the choice of types of information to the scientific community. If "reasonably" means "customarily," the ultimate choice rests with the scientific community. On this assumption, the courts' only function is to make the factual determination whether the customary practice exists.¹⁸⁰ If, however, the use of "reasonably" empowers the judge to second guess the scientific community, the determination remains a judicial responsibility; in making the determination, the judge is likely to give the specialty's practice great weight, but the specialty's practice is not dispositive. At this point in the analysis, the major-minor premise distinction becomes highly relevant. Section II demonstrated that the expert's selection of theories to employ as major premises is entitled to great deference, but the same section also noted that there is a much less compelling case to defer to the expert's choice of information to include in the minor premise. The determination of the facts comprising the minor premise is essentially an exercise of factual analysis rather than scientific expertise. If the scope of rule 703 is limited to the minor premise, the rule's scope cuts strongly against interpreting "reasonably" to mean "customarily." In principle the judiciary should police the reliability of the information factored into the expert's minor premise, and interpreting "reasonably" as "customarily" would deprive the courts of the power to do so.

Finally, a lively dispute has arisen over the question whether information qualifying under rule 703 should be presented to the trier of fact in detail.¹⁸¹ Suppose, for example, that the trial judge decides that in forming her opinion, a physician may rely on an oral report from another doctor. Although the report does not satisfy any hearsay exception,¹⁸² the judge believes that the party call-

178. *Id.* at 275-79.

179. *In re "Agent Orange" Prod. Liab. Litig.*, 611 F. Supp. 1223, 1243-45 (E.D.N.Y. 1985), *aff'd*, 818 F.2d 187 (2d Cir. 1987), *cert. denied*, 108 S. Ct. 2898 (1988).

180. FED. R. EVID. 104(a).

181. *Rose Hall, Ltd. v. Chase Manhattan Overseas Banking Corp.*, 576 F. Supp. 107, 108 (D. Del. 1983), *aff'd*, 740 F.2d 958 (3d Cir. 1984), *cert. denied*, 469 U.S. 1159 (1985); *People v. Anderson*, 113 Ill. 2d 1, 8-9, 495 N.E.2d 485, 488-89, *cert. denied*, 107 S. Ct. 658 (1986); *Long v. State*, 649 S.W.2d 363, 364 (Tex. Ct. App. 1983).

182. As an oral report, the report could not satisfy the requirements of the business entry hearsay exception. FED. R. EVID. 803(6). Assume alternatively that the report is written. If the report was prepared principally with a view to litigation, again the report might not comply with the business entry exception. See *Palmer v. Hoffman*, 318 U.S. 109, 113-14 (1943); P. GIANNELLI & E. IMWINKELRIED, *supra* note 4, § 6-2(c).

ing the physician should be permitted to use the report for the limited purpose of showing the bases of the expert's opinion. How far should the physician be permitted to go in describing the content of the report? Should the physician be restricted to saying that she is relying in part on another physician's report describing some symptoms? Should the physician be allowed to go further and quote the oral report? If the report were in writing, should the report be submitted to the jury for their inspection?

One school of thought is that if a report otherwise satisfies rule 703, the trier of fact should receive the full detail of the report.¹⁸³ The advocates of this school argue that the trier cannot intelligently evaluate the worth of the expert's opinion unless the trier has the benefit of all the detail of the report. The only required safeguard is that the judge give the jury a limiting instruction under Federal Rule of Evidence 105.¹⁸⁴ The competing school of thought is that the judge should be cautious in exposing the jury to independently inadmissible information.¹⁸⁵ The proponents of this school fear that despite the limiting instruction, the jury will misuse the information as substantive evidence on the merits of the case.

The major-minor premise distinction proposed by this Article strengthens the position of the latter school of thought. Section II noted that the danger that the jury will misuse the information contained in the expert's major premise is minimal since that information rarely overlaps with the disputed adjudicative facts in the case. In contrast, the danger of misuse of the information included in the witness' minor premise is substantial since that information frequently coincides with controverted facts such as the manner in which the traffic accident causing the personal injuries occurred. Rule 703 should be read as applying only to the information serving as the witness' minor premise. In short, the rule authorizes reliance on the very type of information that the jury is more likely to misuse. Understanding the scope of rule 703 makes it easier to appreciate the extent of the danger of the misuse of the information; because the information falling within the rule's purview is included in the expert's minor premise, the danger will routinely arise. The scope of rule 703, therefore, lends substance to the argument that, at the very least, judges should exercise discretion in deciding whether to give the jury the full detail of reports qualifying under rule 703.

It seems clear that there is merit in any proposed distinction that not only helps establish an overall framework for construing article VII but also assists in resolving the more particular statutory construction issues surrounding the article. More broadly, the proposed major-minor premise distinction should be a catalyst for the formulation of sounder policy governing expert testimony and more discerning attacks on expert testimony at trial. Policymakers, courts, and

183. See generally Rice, *Inadmissible Evidence as a Basis for Expert Opinion Testimony: A Response to Professor Carlson*, 40 VAND. L. REV. 583 (1987) (facts on data that forms the underlying basis of the expert's opinion should be admitted as an exception to the hearsay rule).

184. FED. R. EVID. 105, .

185. Carlson, *supra* note 86, at 245 n.44.

litigators all stand to benefit from the recognition of this distinction. At every level of analysis, we pay a severe cost for ignoring the distinction: misguided evidentiary policy, the frustration of the statutory scheme of article VII, and the failure at trial to expose the genuine weaknesses in scientific testimony. The appreciation of the distinction is a *sine qua non* for any critical evaluation of the admissibility and weight of expert testimony.

