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VOICE SPECTROGRAPHY EVIDENCE: APPROACHES TO ADMISSIBILITY

Sharon E. Gregory*

The admissibility of the results of voiceprint¹ analysis as evidence in a criminal trial has received a great deal of attention in the last ten years, both from legal scholars² and in the courts.³ Although a relative newcomer to the field of forensic science,⁴ voice spectrography is not a recent development in the field of evidence; Wigmore foresaw the use of a voiceprint as early as 1937, when he

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1. Lawrence G. Kersta's research at Bell Telephone Laboratories in the 1940's led to his creation of the voiceprint identification method. A. MOENSSSENS & F. INBAU, *SCIENTIFIC EVIDENCE IN CRIMINAL CASES* § 12.03 (2d ed. 1978). Kersta coined the term "voiceprint" for his research. See Jones, *Evidence vel non: The Non Sense of Voiceprint Identification*, 62 Ky. L.J. 301, 303 (1973-74); see also *infra* note 20.

In this article, the term "voiceprint" is used to mean the spectrographic prints of one's voice for use in comparing such readings with the actual voice of the person involved, so as to determine whether that person uttered certain words. BLACK'S LAW DICTIONARY 1411 (5th ed. 1979).

2. A comprehensive listing of the many scientific reports and legal commentaries is found in *State v. Gortarez*, 141 Ariz. 254, ___ n. 5, 686 P.2d 1224, 1234 n.5 (1984).

3. *United States v. Baynes*, 687 F.2d 659 (3d Cir. 1982) (admissible); *United States v. Williams*, 583 F.2d 1194 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979) (admissible); *United States v. McDaniel*, 538 F.2d 408 (D.C. Cir. 1976) (inadmissible); *United States v. Baller*, 519 F.2d 463 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975) (admissible); *United States v. Franks*, 511 F.2d 25 (6th Cir.), *cert. denied*, 422 U.S. 1042 (1975) (admissible); *United States v. Jenkins*, 525 F.2d 819 (6th Cir. 1975) (admissible); *United States v. Addison*, 498 F.2d 741 (D.C. Cir. 1974) (inadmissible); *United States v. Williams*, 443 F. Supp. 269 (S.D.N.Y. 1977) (admissible); *United States v. Sample*, 378 F. Supp. 44 (E.D. Pa. 1974) (admissible); *Gortarez*, 141 Ariz. 254, 686 P.2d 1224 (inadmissible); *People v. Kelly*, 17 Ca. 3d 24, 549 P.2d 1240, 130 Cal. Rptr. 144 (1976) (admissible); *People v. Law*, 40 Cal. App. 3d 69, 114 Cal. Rptr. 708 (1974) (inadmissible); *Cornett v. State*, ___ Ind. ___, 450 N.E.2d 498 (1983) (admissible); *State v. Williams*, 388 A.2d 500 (Me. 1978) (admissible); *Reed v. State*, 283 Md. 374, 391 A.2d 364 (1978) (inadmissible); *Commonwealth v. Lykus*, 367 Mass. 191, 327 N.E.2d 671 (1975) (admissible); *People v. Tobey*, 401 Mich. 141, 257 N.W.2d 537 (1977) (inadmissible); *State v. Cary*, 56 N.J. 16, 264 A.2d 209 (1970) (inadmissible); *People v. Collins*, 94 Misc. 2d 704, 405 N.Y.S.2d 365 (Sup. Ct. 1978) (inadmissible); *State v. Williams*, 4 Ohio St. 3d 53, 446 N.E.2d 444 (1983) (admissible); *State v. Olderman*, 44 Ohio App. 2d 130, 336 N.E.2d 442 (1975) (admissible); *Commonwealth v. Topa*, 471 Pa. 223, 369 A.2d 1277 (1977) (inadmissible).

4. The first case in which spectrogram evidence was admitted was *People v. Strahle*, No. 9323/64 (Sup. Ct. Westchester County, N.Y. Apr. 1, 1966).

suggested that the individuality of a person's voice provided a possible means of speaker identification.⁵

The results of voice spectrographic analysis may be used as a prosecution tactic to establish⁶ or corroborate⁷ identity, or as a defense tactic to exculpate the accused.⁸ Courts faced with voice spectrography evidence have arrived at the decision to accept or reject such evidence through a strict⁹ or modified¹⁰ application of the *Frye* doctrine,¹¹ or by applying relevancy and reliability standards.¹² Today, the trend in federal court is to accept the use of voice spectrography evidence, while the trend in state court is to reject such evidence.¹³ Even among the states, decisions are split; two recent state courts considering the admissibility of voice spectrography evidence reached opposite conclusions.¹⁴

In view of the wealth of material describing the mechanics of

5. *Vocal Traits*. By means of a well-understood principle . . . the vibrations of the spoken voice on a diaphragm may be accurately translated . . . into oscillations of a needle, and these oscillations may be arranged to leave a continuous variable inking as a record [T]he spoken voice . . . can now . . . be made to leave a . . . record having minute differences of individuality. . . . If now it can be proved that this individuality of the vocal organ . . . endures . . . , it is obvious that an additional mode of identification . . . has become practicable.

WIGMORE, *THE SCIENCE OF JUDICIAL PROOF* § 156, at 284-85 (3d ed. 1937), cited in *Reed*, 283 Md. at ___ n.1, 391 A.2d at 378 n.1.

6. *State ex rel. Trimble v. Hedman*, 291 Minn. 422, 192 N.W.2d 432 (1971) (identity established for purposes of probable cause to arrest).

7. *Lykus*, 367 Mass. 191, 327 N.E.2d 671.

8. *Gortarez*, 141 Ariz. 254, 686 P.2d 1224 (evidence held inadmissible, but court indicated that reconsideration in light of future development of the method would be appropriate).

9. See, e.g., *Reed*, 283 Md. 374, 391 A.2d 364.

10. See, e.g., *Lykus*, 367 Mass. 191, 327 N.E.2d 671.

11. *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923) (holding scientific evidence inadmissible if it has not achieved general scientific acceptance); see *infra* notes 54-72.

The *Frye* case considered and rejected use of the polygraph; therefore, reliance on the *Frye* test for the admissibility of other kinds of scientific evidence may be misplaced. There are many problems with admitting polygraph evidence which do not arise in considering the admissibility of voice spectrograph evidence. Chief among these problems is the fear that a jury will give the polygraph conclusive weight; the polygraph, which purports to establish honesty or credibility, thus usurps the very function of the jury. See also *infra* note 20. See generally Comment, *Voice Spectrogram Analysis: A Case of False Elimination*, 1980 ARIZ. ST. L.J. 217, 227-28.

12. See, e.g., *Franks*, 511 F.2d 25; *Williams*, 4 Ohio St. 3d 53, 446 N.E.2d 444.

13. *Reed*, 391 A.2d at 407 (Smith, J., dissenting). But see Note, *Voiceprints in the Courtroom-Scientific and Evidentiary Problems*, 21 ARIZ. L. REV. 1163, 1163 (1979) (suggesting that identification of a trend is premature).

14. Compare *Gortarez*, 141 Ariz. 254, 686 P.2d 1224 (error to admit spectrographic comparisons as exculpatory evidence because of the lack of general acceptance in the relevant scientific community) with *Williams*, 4 Ohio St. 3d 53, 446 N.E.2d 444 (spectrographic voice identification testimony and exhibits allowed).

voice spectrography,¹⁵ this article will discuss that topic only briefly.¹⁶ The article will focus on the various approaches taken by courts in deciding whether to admit voiceprint evidence,¹⁷ and a plan for admissibility will be proposed.¹⁸ Finally, the article will predict the reception of voiceprint evidence in the Virginia courts.¹⁹

I. MECHANICS OF VOICE SPECTROGRAPHY

A. *The Process*

Speech spectrography is a technique which transforms acoustical signals produced by the human voice into a visual representation. The resulting visual representation is called a spectrogram.²⁰ The examiner listens to tapes of known voices and selects similar words and phrases to compare. The selected words are cut from the tape and placed around a drum on the spectrograph. As the spectrograph's drum rotates, a magnetic head scans the tape and records

15. See, e.g., *Law*, 40 Cal. App. 3d 69, 114 Cal. Rptr. 708; A. MOENSSENS & F. INBAU, *supra* note 1, §§ 12.04, 12.05; Kersta, *Speaker Recognition and Identification by Voiceprints*, 40 CONN. B.J. 586 (1966); Note, *supra* note 13, at 1164-67; 19 AM. JUR. PROOF OF FACTS 423-54.

16. See *infra* notes 20-28 and accompanying text.

17. See *infra* notes 47-93 and accompanying text.

18. See *infra* notes 94-124 and accompanying text.

19. See *infra* notes 125-51 and accompanying text.

20. Siegel, *Cross-Examination of a "Voiceprint" Expert: A Blueprint for Trial Lawyers*, 12 CRIM. L. BULL. 509, 510 (1976).

Voiceprints should not be confused with fingerprints. "[V]oiceprint,' with its overtones of 'fingerprint,' gives voice spectrographic identification an aura of absolute certainty and accuracy which is neither justified by the facts nor claimed by experts in the field." *United States v. Baller*, 519 F.2d 463, 465 n.1 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975); see also *Cornett v. State*, ___ Ind. ___, 450 N.E.2d 498, 500 (1983) ("Courts and experts generally avoid use of the term 'voiceprints' because it may potentially lead to an unwarranted association with fingerprint evidence, which has repeatedly been shown to be undeniably accurate in the identification of individuals.").

The court in *State v. Gortarez*, 141 Ariz. 254, 686 P.2d 1224 (1984), noted that "speech spectrograms are fundamentally different from fingerprints. Whereas the anatomical ridges in the skin are topologically invariant and remain essentially unaltered throughout a person's lifetime, repeated utterances of the same word by the same speaker are not acoustically invariant and change markedly with age." *Id.* at ___ n.2, 686 P.2d at 1233 n.2.

Nor should an analogy be made between voiceprint and polygraph results:

Spectrography is qualitatively different from polygraph evidence. In spectrography, the examiner merely compares spectrograms reflecting the purely physical characteristics of a voice. In polygraph analysis, the examiner must go on, to extrapolate a judgment of something not directly measured by the machine, i.e., the credibility of the person examined. . . . [U]npredictable variables . . . make the polygraph technique far more speculative than is spectrographic analysis.

United States v. Williams, 583 F.2d 1194, 1199 n.9 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979) (citation omitted).

different bands of frequencies;²¹ the spectrogram which results appears as a series of patterns on paper.²² A tridimensional plane is formed, with time plotted on the vertical axis, and the intensity of the voice displayed by the darkness or shading of the lines on the horizontal axis.²³ A formant, which varies in appearance according to the sound recorded, is a group of close, high intensity frequencies appearing on the spectrogram as a dark band.²⁴

The expert examines two voice exemplars to determine whether a match exists:²⁵

An examiner will seek to compare the mean frequency of the formants in one spectrogram with the mean frequency of the formants in the second spectrogram. . . . A second factor considered and compared is the actual widths of the formants. An examiner will also compare the gaps and the types of verticle striations on lines. Lines that are relatively far apart generally indicate a low-pitched voice; lines that are relatively close together generally indicate a high-pitched voice.²⁶

The spectrogram examiner also compares diphthongs, or combinations of vowels, which appear on the exemplar as sloping formants, and duration or rate of speech.²⁷ Finally, the examiner makes an aural comparison.²⁸

B. *Theoretical Underpinnings*

Voice identification through the use of sound spectrography is premised on two principles. The first principle is that individuals are anatomically unique, and the parts of the anatomy involved in speaking create the peculiar sound of an individual's voice. The second principle is that anatomic variations between individuals result in differences when two speakers utter the same sound. It is the differences between speakers which raises identification possibilities ("interspeaker variation").²⁹ Second, individuals have dif-

21. Note, *supra* note 13, at 1166.

22. *Cornett*, 450 N.E.2d at 500.

23. *Id.*

24. *Siegel*, *supra* note 20, at 511.

25. See *infra* notes 117-19 and accompanying text.

26. *Siegel*, *supra* note 20, at 511.

27. *Id.*

28. Note, *supra* note 13, at 1167; see also *infra* note 119 and accompanying text.

29. *Siegel*, *supra* note 20, at 509-10.

ferent, but stable, patterns in the way the vocal apparatus is used in speaking, and these basic patterns are not affected by minor variations ("intraspeaker variability") in a person's voice.³⁰ Simply stated, "[t]he validity of sound spectrography as a reliable identification technique must . . . be based on the assumption that *inter-speaker* variability is always greater than *intraspeaker* variability."³¹

Proponents of voice spectrography as a tool for identification advance, as support for the first principle, the uniqueness of a person's voice, that each of us is born with a different and unique combination of physical characteristics constituting the vocal mechanism—the voice cavities (the throat, nose and mouth) and the articulators (lips, teeth, tongue, soft palate, and jaw muscles).³² This theory lacks precise scientific proof,³³ but it is nonetheless the basis from which any attempt at voice identification by the spectrographic method must flow. The premise is based on the remoteness of the possibility that any two persons would have the same size and coupling of vocal cavities and dynamic use patterns of their articulators.³⁴

The second principle, that a person's voice remains relatively unchanged over time, gives rise to an even more fertile area of controversy. Proponents of voice spectrography readily admit that intraspeaker variability, caused by a number of factors, can indeed "change" a person's voice. Intraspeaker variability may result from

30. A. MOENSSSENS & F. INBAU, *supra* note 1,] 12.]04; Comment, *supra* note 11, at 219; Note, *Admissibility of Scientific Evidence: Voice Spectrography*, 17 AKRON L. REV. 701, 701 (1984) [hereinafter cited as Note, *Admissibility of Scientific Evidence*]; Note, *supra* note 13, at 1164.

Further assumptions are that the spectrographic machine accurately reflects and displays the uniqueness of a human voice, and that the examiner can accurately identify a voice on the basis of subjective comparisons of spectrograms. Note, *supra* note 13, at 1164.

31. Siegel, *supra* note 20, at 510.

32. A. MOENSSSENS & F. INBAU, *supra* note 1, § 12.04.

33. Moenssens, *Admissibility of Scientific Evidence—An Alternative to the Frye Rule*, 25 WM. & MARY L. REV. 545, 557 (1984).

Professor Moenssens notes that

[t]he theory of voice uniqueness, however, which the scientific community should have subjected to a searching . . . inquiry, never has been proven by empirical evidence. As long as the theory remains a postulate, and not a proven fact, the technique of comparing voice spectrograms cannot establish the identity of a speaker with any relative degree of certainty.

Id.; see also Note, *supra* note 13, at 1164-66.

34. A. MOENSSSENS & F. INBAU, *supra* note 1, § 12.04; Note, *supra* note 13, at 1166.

purposefully changing or disguising one's voice,³⁵ as well as from the effects brought on by a common cold, fatigue, stress, mood, allergies, medication, intoxicants, dental work,³⁶ aging³⁷ and, in the extreme case, surgery to any part of the vocal mechanism.³⁸ Proponents of the spectrographic identification method hypothesize that intraspeaker variability, however, is less than interspeaker variability; therefore, the existence of intraspeaker variations does not make identification of an unknown speaker unreliable.³⁹

The constancy of the voice, according to one expert, is grounded on the energy emitted during speech. Speech energy occurs on two levels—a conscious level, where a person may attempt to alter his voice, and a secondary level, over which a person has no conscious control. “[The secondary level] is not really relevant to the speech, and because [the speaker] doesn't really bother about controlling that, it always turns out that [the secondary level] remains very constant, even though he tries to change his voice to make it different.”⁴⁰ The underlying premise is that regardless of how a person may attempt to disguise his voice, the aural and vocal mechanisms with which he is born make it virtually impossible for him to successfully disguise his voice.

The underlying theories of voice uniqueness and the relative stability of an individual's vocal pattern have been tacitly accepted by courts for many years. The testimony of a lay witness identifying a person by having heard his voice is regarded as legitimate and

35. Siegel, *supra* note 20, at 522-24; see also *People v. Law*, 40 Cal. App. 3d 69, 114 Cal. Rptr. 708 (1974) (possibility of mimicry rendered voice spectrography evidence inadmissible).

36. *State v. Gortarez*, 141 Ariz. 254, —, 686 P.2d 1224, 1235 (1984).

37. Siegel, *supra* note 20, at 533-34.

38. Comment, *supra* note 11, at 224. Dr. Oscar Tosi, a leading researcher and practitioner in the field of voice spectrography, has opined that oral and nasal surgery or deliberate changes in speech might increase the possibility of falsely eliminating a suspected person as the one who produced a certain sample; but such changes would not increase the chances of a false identification. *Reed v. State*, 283 Md. 374, —, 391 A.2d 364, 414 (1978).

39. Kersta, *supra* note 15, at 591. *But see* Comment, *supra* note 11, at 219 (“The existence of intraspeaker variability seems to cast doubt on the accuracy of spectrogram analysis as a fact-finding device and confuses its admissibility.”).

40. *Reed*, 283 Md. at —, 391 A.2d at 416. The expert who testified in the trial was Dr. Leendert Peter Christian Jensen, a South African physicist and electrical engineer. Dr. Jensen's observations were based on his own studies. He concluded that speech must be examined in the context of comparing bold black lines on the spectrogram with their attendant faint lines. He found similarities in the sets of lines only when the people were actually the same. *Id.*

competent evidence for the purpose of establishing identity.⁴¹ Similarly, identification evidence of fingerprints and blood samples is predicated on anatomical uniqueness.⁴²

These theories and concerns have been focal points of several notable studies conducted in efforts to buttress⁴³ or disparage⁴⁴ voice spectrography. In a study requested by the National Academy of Sciences, the National Research Council assembled a multidisciplinary group of scientists which concluded that it could not determine whether voice spectrography was a "fully developed technology based solidly on science."⁴⁵ The committee reported, "At the present time, the technique of voice identification is a practical methodology that is rather widely used, but that lacks a solid theoretical basis of answers to scientific questions concerning the foundations of voice identification."⁴⁶ Until new surveys by equally impartial groups are undertaken and published, it would appear that the lack of bases for the theoretical underpinnings of voice spectrography is the main impediment to its acceptance as a forensic method of identification.

II. JUDICIAL APPROACHES TO ADMISSIBILITY

As various courts have wrestled with the question of whether to admit voiceprint evidence, several approaches have emerged. A

41. Comment, *supra* note 11, at 221. In *United States v. Armedo-Sarmiento*, 545 F.2d 785 (2d Cir. 1976), *cert. denied*, 430 U.S. 917 (1977), the Second Circuit Court of Appeals upheld identification testimony by an interpreter who had never directly conversed with the defendant, based on the interpreter's comparison of an unidentified voice on a tape with tapes of the voice of the defendant. The court noted that the argument that the witness and the defendant had never met went to the weight, not the admissibility, of the evidence. *Id.* at 792.

42. Comment, *supra* note 11, at 220-21. The use of blood-typing evidence is statistical, since individual uniqueness of blood is almost impossible to show. "[S]ince voice spectrograms can vary within the samples of one individual," according to one view, "the evidence is at the least a very specific grouping identification." *Id.* at 221 n.22.

43. Kersta, *Voiceprint Identification*, 196 NATURE 1253 (1962). For a summary of the scientific debate, see Note, *supra* note 13, at 1168-73.

44. Bolt, Cooper, David, Denes, Pichett & Stevens, *Speaker Identification by Speech Spectrograms: A Scientist's View of Its Reliability for Legal Purposes*, 47 J. ACOUST. SOC'Y AM. 597 (1970); Tosi, Oyer, Lashbrook, Redroy, Nichol & Nash, *Experiment in Voice Identification*, 51 J. ACOUST. SOC'Y AM. 2030 (1972) [hereinafter cited as *Experiment in Voice Identification*]. Although Dr. Tosi originally criticized Kersta's work, he later became an advocate of the voice spectrographic method. See Moenssens, *supra* note 33, at 549.

45. Committee on Evaluation of Sound Spectrograms, National Research Council, *On the Theory and Practice of Voice Identification* 12 (1979).

46. *Id.* at 10-12.

number of courts have applied the *Frye*⁴⁷ test of admissibility of a novel scientific technique, or a variant of that standard, in determining whether to admit voice spectrography evidence.⁴⁸ Federal courts have required that the novel scientific technique be shown to be relevant and reliable.⁴⁹ At least one state court has adopted a case-by-case flexible standard derived from that state's rules of evidence.⁵⁰

Courts following the *Frye* test of admissibility, or a modification of *Frye*, have been uncertain as to whether their role is to determine if general acceptance exists, or whether it is the court's duty to determine the reliability of the method.⁵¹ There is also some confusion as to whether voice spectrography evidence, as it is presented in court, is a scientific method or merely an opinion by an expert.⁵² The confusion is further compounded by the fact that "[c]ourts experience difficulty determining whether the underlying principle, the instrument that measures certain data, or a technique devised to evaluate the data requires general acceptance."⁵³

A. *The Frye Test and Its Modification*

The *Frye* test did not gain immediate judicial approval when the decision was rendered in 1923.⁵⁴ However, its popularity as a legal test for the admissibility of novel scientific evidence spread, and *Frye* is now cited in almost every criminal case considering the admissibility of novel scientific evidence.⁵⁵

In order to admit voice identification evidence based on comparisons of spectrograms, courts have found it necessary to deviate

47. *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923); see, e.g., *Reed v. State*, 283 Md. 374, 391 A.2d 364 (1978).

48. E.g., *United States v. Franks*, 511 F.2d 25 (6th Cir.), cert. denied, 422 U.S. 1042 (1975). The court in *Franks* noted, however, that it deemed "general acceptance as being nearly synonymous with reliability." *Id.* at 33 n.12.

49. Note, *Admissibility of Scientific Evidence*, *supra* note 30, at 704.

50. E.g., *State v. Williams*, 4 Ohio St. 3d 53, 446 N.E.2d 444 (1983). The Supreme Court of Iowa adopted this approach when considering another kind of novel scientific evidence, blood flight patterns. *State v. Hall*, 297 N.W.2d 80 (Iowa 1980).

51. *Siegel*, *supra* note 20, at 541. (discussing *Commonwealth v. Lykus*, 367 Mass. 191, 327 N.E.2d 671 (1975)).

52. *Siegel*, *supra* note 20, at 529 (discussing *Reed v. State*, 283 Md. 374, 391 A.2d 364 (1978)).

53. Moenssens, *supra* note 33, at 555.

54. *Id.* at 546.

55. *Id.*

from the *Frye* test.⁵⁶ Since the scientific community in general was unfamiliar with voice spectrography,⁵⁷ *Frye's* requirement of general acceptance posed an insurmountable impediment to the admissibility of voiceprint evidence. The test was reformulated so that "the requirement of the *Frye* rule of general acceptability is satisfied . . . if the principle is generally accepted by those who would be expected to be familiar with its use."⁵⁸

A distinction should be drawn, however, between limiting the field of experts for purposes of admissibility of the evidence and for purposes of testimony at trial:

If the scientific field is expanded, . . . contradictory evidence of reliability will presumably be more available. But, if no experts who are or would be expected to be familiar with a process dispute the validity or reliability of the process, it is overly cautious for the court to exclude the evidence because it fears that the field, so limited, may be biased. To guard against uniformly biased testimony at trial, the field of experts for admissibility need not equal the field for testimony. In other words, a court should decide the threshold question of admissibility based upon testimony from experts most qualified to evaluate the validity of the technique, those who are or would be expected to be familiar with the technique. Then at trial, expert testimony from someone whose expertise makes him capable of understanding the technique . . . [w]ould be admitted to attack the reliability of the evidence.⁵⁹

If the field of relevant scientists is narrowed to those scientists genuinely familiar with voice spectrography, then voiceprint evidence may be admissible. According to Dr. Tosi, "there is general acceptance of this technique among the scientists actually working in the field or genuinely familiar with the field."⁶⁰

However, in 1976 and thereafter, courts began to question whether a single witness, whose career was built around voice spec-

56. Note, *Admissibility of Spectrographic Voice Identification in the State Courts*, 70 J. CRIM. L. & CRIMINOLOGY 349, 351 (1979).

57. Moenssens, *supra* note 33, at 549 (indicating that the scientific field consisted of only "the professor of audiology who embraced the voiceprint after initially spurning it and the electrical engineer who first coined the term 'voiceprint'").

58. *Lykus*, 367 Mass. 191, —, 327 N.E.2d 671, 677; see also *People v. Williams*, 164 Cal. App. 2d 858, 861-62, 331 P.2d 251, 254 (1958) (salline test admissible because it had been "generally accepted by those who would be expected to be familiar with its use").

59. Comment, *supra* note 11, at 230.

60. *Reed*, 283 Md. at —, 391 A.2d at 414 (Smith, J., dissenting); Comment, *supra* note 11, at 231.

trography, "may be too closely identified with the endorsement of voiceprint analysis to assess fairly and impartially the nature and extent of any opposing scientific views."⁶¹ Some jurisdictions retreated from the loosening of the *Frye* standard, and instead demanded strict compliance with the *Frye* test for admission of novel scientific evidence.⁶² This shift led to a judicial determination of what comprises the "particular field"⁶³ of voice spectrography.⁶⁴

The Maryland Court of Appeals, in *State v. Reed*,⁶⁵ decided that such a field was comprised of "those whose scientific background and training are sufficient to allow them to comprehend and understand the process and form a judgment about it."⁶⁶ The court disapproved the trial court's restriction of the field of relevant experts to those who are knowledgeable and work directly with the technique.⁶⁷ The Arizona Supreme Court noted, in *State v. Gortarez*,⁶⁸ that an appropriate field of disinterested experts would possibly include acoustical engineers, communications electronists, linguists, phoneticians, physicists and speech communications experts.⁶⁹ The Indiana Supreme Court would include experts in the fields of linguistics, psychology and engineering, in addition to those people who use voice spectrography for identification purposes.⁷⁰

Although delineation of the field and acceptance of the witness as an expert are pivotal concerns, the inquiry under *Frye* does not end there. General acceptance within the scientific community must be demonstrated. In *Commonwealth v. Topa*,⁷¹ the Pennsylvania Supreme Court recognized a Michigan state trooper as an expert and praised his credentials in voice spectrography, but declined to recognize the reliability of the process of voice spectrography. The court concluded that one officer's testimony was insufficient to establish general acceptance by scientists active in the

61. *People v. Kelly*, 17 Cal. 3d 24, 38, 549 P.2d 1240, 1249, 130 Cal. Rptr. 144, 153 (1976); Moenssens, *supra* note 33, at 550.

62. *E.g.*, *Reed*, 283 Md. 374, 391 A.2d 364.

63. *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923).

64. Moenssens, *supra* note 33, at 548 (noting that voice spectrography is an area where courts sometimes have difficulty with this step of the analysis).

65. 283 Md. 374, 391 A.2d 364.

66. *Id.* at ___, 391 A.2d at 368.

67. *Id.* at ___, 391 A.2d at 377.

68. 141 Ariz. 254, 686 P.2d 1224 (1984).

69. *Id.* at ___, 686 P.2d at 1233.

70. *Cornett v. State*, ___ Ind. ___, ___, 450 N.E.2d 498, 503 (1983).

71. 471 Pa. 223, 369 A.2d 1277 (1977).

field to which the evidence belongs.⁷²

B. *Relevance and Reliability Standards*

In considering the admissibility of voiceprint evidence, federal courts generally have limited the field of scientists to those who would be expected to be familiar with voice spectrography, and have focused on the reliability of the method rather than its general acceptance.⁷³ This approach is echoed in Dean McCormick's view that "[a]ny relevant conclusions which are supported by a qualified expert witness should be received unless there are other reasons for exclusion."⁷⁴ Disagreement among experts as to the reliability or general acceptance of the method becomes an issue for the jury to weigh.⁷⁵

Noting that scientific evidence need not be infallible to be reliable,⁷⁶ the Second Circuit Court of Appeals held, in *United States v. Williams*,⁷⁷ that "[t]he sole question is whether spectrographic analysis has reached a level of reliability sufficient to warrant its use in the courtroom."⁷⁸ The court identified as indicators of relia-

72. *Id.* at ___, 369 A.2d at 1281.

73. *E.g.*, *United States v. Williams*, 583 F.2d 1194 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); *United States v. Baller*, 519 F.2d 463 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975); *accord State v. Hall*, 297 N.W.2d 80 (Iowa 1980) (blood pattern evidence), *cert. denied*, 450 U.S. 927 (1981).

Dean McCormick offers support for this approach: "'[g]eneral scientific acceptance' is a proper condition for taking judicial notice of scientific facts, but not a criterion for the admissibility of scientific evidence." C. MCCORMICK, *HANDBOOK OF THE LAW OF EVIDENCE* § 203 (E. Cleary 2d ed. 1972).

74. C. MCCORMICK, *supra* note 73, § 203, at 491 (citation omitted). In adopting a "relevant and reliable" test for admissibility of spectrographic evidence, the Sixth Circuit Court of Appeals noted that given the considerable discretion on the part of the trial judge to admit or exclude such evidence, "[i]f a scientific process is reliable, or sufficiently accurate, courts may also deem it 'generally accepted.'" *United States v. Franks*, 511 F.2d 25, 33 (6th Cir.), *cert. denied*, 422 U.S. 1042 (1975).

75. An oft-cited example of allowing the jury to resolve the reliability or general acceptance issue is *Coppolino v. State*, 223 So. 2d 68 (Fla. Dist. Ct. App. 1968), *appeal dismissed*, 243 So. 2d 120 (Fla. 1969), *cert. denied*, 399 U.S. 927 (1970). In *Coppolino*, the defendant was charged with injecting his wife with a drug for which the medical profession believed there was no method for detection in a corpse. The state toxicologist developed a method of detection specifically for that case; the evidence was admitted, along with the conflicting testimony of each party's experts regarding the reliability of the method.

76. *See also* Moenssens, *supra* note 33, at 566.

77. 583 F.2d 1194 (2d Cir. 1978).

78. *Id.* at 1198. The court declined to follow the *Frye* test, noting that "[t]here is no clearly defined, universal, litmus test for the general admissibility of all 'scientific' evidence." *Id.* at 1197; *see also* Moenssens, *supra* note 33, at 565-66 ("The belief that the application of a single, mechanistic test such as the *Frye* rule can determine the difficult

bility the low potential rate of error,⁷⁹ the existence and maintenance of standards,⁸⁰ the absence of abuse of the technique,⁸¹ the analogous relationship of voice spectrography with other similar scientific techniques,⁸² the presence of "failsafe" characteristics,⁸³ and the adversarial system itself which allows the indicators of reliability to be attacked at trial.⁸⁴

The relevancy prong of the analysis of the admission of evidence deriving from novel scientific techniques is grounded in the Federal Rules of Evidence governing expert testimony. Rule 702 provides that a witness who qualifies as an expert may testify "[i]f scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or determine a fact in issue."⁸⁵ Further, Rule 901(b)(5) specifically provides for the identification of any voice by any person who can "connect" the voice with the alleged speaker by any method of "hearing" the voice.⁸⁶ It has therefore been suggested that testimony by an expert witness who has identified a voice by the voiceprint technique is also admissible.⁸⁷ However, under the Federal Rules of Evidence, or an analogous state rule, the expert testimony will not be admitted unless it is relevant. "For scientific evidence to be relevant, there must be 'some demonstration that it is sufficiently reliable to make the existence or nonexistence of a fact more probable than without the evidence.'"⁸⁸

issue of reliability in every case is [an] example of the scientific illiteracy that hampers courts.").

79. In the most comprehensive study of spectrography made to date, involving experiments at Michigan State University with voices recorded directly and over the telephone, with and without background noise, with words spoken in context and in isolation, and with recordings made contemporaneously and at different times, Dr. Tosi arrived at a false identification rate of 6.3%, a rate reduced to 2.4% when doubtful comparisons were eliminated.

Williams, 583 F.2d at 1198 (citations omitted).

80. "The International Association of Voice Identification, an organization concerned with training and certification of spectrograph examiners and with procedures, requires that ten matches be found before a positive identification can be made." *Id.*

81. The examiner who testified claimed positive identifications in 8% of 200 cases and reported an inability to reach a decision in 76% of the cases. *Id.* at 1199.

82. The court cited as examples handwriting exemplars and gun barrel striations. *Id.*

83. "[I]naccuracies in the spectrograms, or failure to accurately reflect the voice of the accused, is more likely to redound to [the defendant's] benefit than to his detriment." *Id.*

84. *Id.*

85. FED. R. EVID. 702

86. FED. R. EVID. 901(b)(5).

87. 5 WEINSTEIN ON EVIDENCE 901(b)(5)[01] (1978) (cited in Comment, *supra* note 11, at 232-33 n.73).

88. Note, *Voice Identification Testimony Based on Spectrographic Analysis Inadmissi-*

Chief among the state courts which have opted for a relevance and reliability test for admission of voiceprint evidence is the Ohio Supreme Court. In *State v. Williams*,⁸⁹ the defendant pushed his way into his victim's home and called for an ambulance to be sent to a fictitious address. The telephone conversation was routinely recorded by the ambulance service and was later compared to a series of recordings made of the defendant's voice after his arrest. The positive identification of his voice led to the defendant's conviction. On appeal, the Ohio Supreme Court rejected the *Frye* test for admissibility of scientific evidence. Instead, the court endorsed a more flexible standard derived from its own rules of evidence. The court cited with approval a Maine case wherein that court refused to adopt a special rule for scientific evidence, preferring to follow the fundamental philosophy of the state rules favoring admissibility of scientific evidence "whenever it is relevant and can be of assistance to the trier of fact."⁹⁰ In refusing to engage in "scientific nose-counting for the purpose of deciding whether evidence based on newly-ascertained or applied scientific principles is admissible,"⁹¹ the Ohio court left the admissibility of expert testimony to the discretion of the state's judiciary, to be decided on a case-by-case basis.⁹² Admissibility would therefore depend upon whether such testimony is relevant and would assist the trier of fact, as required by the Ohio Rules of Evidence.⁹³

ble Because the Technique Has not Gained General Acceptance in the Scientific Community, Reed v. State, 39 Md. L. Rev. 629, 637 (1980). Professor Moenssens cautions that a loosely structured relevancy test could result in the admission of scientific evidence which has not been shown to be reliable, because it would satisfy the "more or less" probable test of Rule 401. Moenssens, *supra* note 33, at 563 n.71.

89. 4 Ohio St. 3d 53, 446 N.E.2d 444 (1983).

90. *Id.* at —, 446 N.E.2d at 447 (citing *State v. Williams*, 388 A.2d 500, 503 (Me. 1978)).

91. *Williams*, 4 Ohio St. 3d at —, 446 N.E.2d at 448.

92. See also *Hall*, 297 N.W.2d at 85 ("[d]etermination of admissibility of [novel scientific] evidence must necessarily be made on an ad hoc basis" [citation omitted]); Moenssens, *supra* note 33, at 565 (a new procedure for the admissibility of novel scientific evidence "must be sufficiently flexible to permit the court to determine admissibility on an ad hoc basis").

On the other hand, the case-by-case approach was specifically rejected by the Maryland Court of Appeals in *Reed v. State*, 283 Md. 374, 391 A.2d 364 (1978). The court applied the *Frye* rule to voice spectrography evidence and found such evidence inadmissible, insisting that "considerations of uniformity and consistency of decision-making require that a legal standard or test be articulated by which the reliability of a process may be established." *Id.* at —, 391 A.2d at 368.

93. *Williams*, 4 Ohio St. 3d at —, 446 N.E.2d at 448.

C. A Model for Admissibility

A model for the admission of voiceprint evidence, with accompanying safeguards, can be derived from the Ohio court's discussion and holding. The threshold requirement is, of course, that the court apply either a flexible standard based on evidentiary rules governing expert testimony or a modified version of the *Frye* standard, by which voice spectrography would be admissible if it is accepted as reliable by experts in the field of voice identification.⁹⁴

Second, there must be some testimony regarding reliability⁹⁵ in the form of the history and mechanics of voice identification.⁹⁶ The prosecution in *State v. Williams*⁹⁷ established the reliability of voice spectrography through the testimony of the Chairman of the Board of Directors of the International Organization of Voice Identification, which certifies all qualified voice analysts. This witness testified that "a body of scientists, technicians and technologists has developed since World War II in the field of voice identification, that an international organization devoted to establishing standards of certification has been established, and that within this community of scientists, the reliability of voice identification is without dispute."⁹⁸ However, courts have not agreed upon the degree of reliability which must be demonstrated. The Iowa Supreme Court has suggested that where a party seeks to admit novel

94. See *supra* notes 56-60 and accompanying text.

95. Professor Moenssens, in advocating a new procedure for admissibility of novel scientific evidence which "emphasize[s] reliability of the technique rather than its general acceptance," notes that

[t]he paramount function of an admissibility procedure is to ensure that admissible novel expert testimony is reliable and that unreliable evidence is excluded. This function is entirely consistent with the general rules of relevancy, which limit the admission of evidence to information that will aid the trier of fact in properly determining the issues.

Moenssens, *supra* note 33, at 565.

On the other hand, the Maryland Court of Appeals has maintained

[t]he question of the reliability of a scientific technique or process is unlike the question, for example, of the helpfulness of particular expert testimony to the trier of fact in a specific case. The answer to the question about the reliability of a scientific technique or process does not vary according to the circumstances of each case. It is therefore inappropriate to view this threshold question of reliability as a matter within each trial judge's individual discretion.

Reed v. State, 283 Md. 374, ___, 391 A.2d 364, 367 (1978).

96. The need for this step will be obviated as the reliability of voice spectrography, or its general acceptance, becomes a judicially noticed fact. See *McCORMICK*, *supra* note 73.

97. 4 Ohio St. 3d 53, 446 N.E.2d 444 (1983).

98. *Id.* at ___, 446 N.E.2d at 448.

scientific evidence which hinges upon an examiner's analysis, a "strong showing" of reliability is necessary.⁹⁹ In a case involving the admissibility of microscopic hair analysis, the Oregon Court of Appeals concluded that "the only foundation required where the technique has not been accepted . . . is that there be credible evidence on which the trial judge may make the initial determination that the technique is *reasonably reliable*."¹⁰⁰ The opposing party may rebut the reliability testimony through its own experts.¹⁰¹ "[R]efutation evidence or evidence of disagreement in the scientific community regarding the reliability of the process bears on the weight, not the admissibility, of that evidence."¹⁰²

Once the technique is recognized as reliable, the analyst must be qualified as an expert by the laying of a proper evidentiary foundation.¹⁰³ In giving his opinion, the analyst makes one of five determinations: an absolute identification, an absolute elimination, a probable identification, a probable elimination, or no decision.¹⁰⁴

The Ohio Supreme Court noted with approval that the trial court allowed the introduction of the original tapes and "the playing of the tapes for the jury, so they could hear for themselves the voice(s) at issue."¹⁰⁵ Such a practice is simply a reflection of what spectrographic experts customarily incorporate into the identification process.¹⁰⁶

Probably the most effective safeguard governing the use of voice spectrographic evidence lies in proper and thorough cross-examination of the expert witness.¹⁰⁷ An attack may be made on the extent of the studies or experiments in the spectrographic identifica-

99. *State v. Hall*, 297 N.W.2d 80, 86 (Iowa 1980).

100. *State v. Kersting*, 50 Or. App. 461, —, 623 P.2d 1095, 1101 (1981) (emphasis added).

101. *Williams*, 4 Ohio St. 3d at —, 446 N.E.2d at 448.

102. *Kersting*, 50 Or. App. at —, 623 P.2d at 1099 (citation omitted).

103. *Admissibility of Scientific Evidence*, *supra* note 30, at 705.

104. *Williams*, 4 Ohio St. 3d at —, 446 N.E.2d at 446; *see also supra* note 81. Although a false elimination—a failure to identify—would not adversely affect an accused, it is important to note that if the method falsely eliminates a large number of persons, the spectrogram will diminish in value as an exculpatory device. Comment, *supra* note 11, at 223.

105. *Williams*, 4 Ohio St. 3d at —, 446 N.E.2d at 448-49. The Fourth Circuit Court of Appeals also approved the playing of the tapes for the jury. *United States v. Baller*, 519 F.2d 463, 467 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975).

The prosecution adopted a similar procedural safeguard in *Commonwealth v. Lykus*, 367 Mass. 191, 327 N.E.2d 671 (1975). Eight witnesses listened to a recorded telephone call in court; six of them identified the voice as that of the defendant.

106. *See Note, supra* note 13, at 1167; *see also infra* note 121 and accompanying text.

107. *See generally Siegel, supra* note 20.

tion method,¹⁰⁸ as well as on the empirical methods employed.¹⁰⁹ Although Dr. Tosi, a leading figure in the field, has claimed that the error rate in an empirical setting can be reduced to a negligible amount in actual practice, no empirical evidence supports his assertions.¹¹⁰

In addition to questioning the expert regarding the validity of empirical studies, the spectrographic analysis may be attacked by questioning the examiner concerning the number of samples he had for comparison in the particular case. The Tosi study indicates that there is an increase in identification error when there are numerous spectrograms of known voices to be compared with an unknown voice.¹¹¹

Other areas of investigation by cross-examination are distortions in the particular telephonic transmission and background noise,¹¹² the possibility of mimicry or disguise,¹¹³ and the emotional state of the speaker.¹¹⁴

Counsel opposing the use of voice spectrographic analysis must realize that

[w]hen two different speakers utter the same sound, the spectrograms for these utterances are remarkably similar in appearance in spite of the fact that different speakers were involved. The reason for this striking similarity is that a spectrogram emphasizes the information that characterizes the *message* (i.e., the words that the speaker has uttered) and does not emphasize the distinctive characteristics of the speakers.¹¹⁵

To combat the possible prejudicial effect of two spectrograms of

108. One leading study of voice spectrography was conducted by Dr. Oscar Tosi in 1971 at Michigan State University through a grant by the United States Department of Justice. The method of recording, the phonetic context, the number of "known" speakers, the interval of time, and the examiners' awareness of the speaker's presence in the pool of possibilities were tested variables. *Id.* at 518-19.

109. In Dr. Tosi's 1971 experiment, all the subjects were native speakers of American English, approximately the same age, with no speech disabilities. A group of examiners was chosen and given one month of training in voice identification using the spectrographic method. *Id.* at 518.

110. *Id.* at 521.

111. *Id.* at 524.

112. *Id.* at 526.

113. *Id.* at 522-24. In *People v. Law*, 40 Cal. App. 3d 69, 114 Cal. Rptr. 708 (1974), the voice spectrographic analysis was not admitted because of the possibility of mimicry.

114. Siegel, *supra* note 20, at 525-26.

115. *Id.* at 528 (emphasis in original).

the same spoken words, the attorney opposing the spectrographic analysis might request that the spectrograms be kept from the sight of the jury. Having spectrograms made of the voices of two different people uttering the same word is another alternative.¹¹⁶

The subjectivity of voice identification offers yet another area for cross-examination.¹¹⁷ Each examiner, in a sense, follows his own processes and sets his own criteria.¹¹⁸ Authorities differ as to the number of points of similarity necessary between the exemplars before concluding that there is a match, but generally ten to twenty comparable points indicate a match.¹¹⁹ The aural comparison of voice exemplars that comprises a part of the spectrographic analysis relies on the questionable premise that the ears are always reliable.¹²⁰

An instruction to the jury concerning the weight to be given to the spectrographic evidence presents yet another opportunity to safeguard the use of the evidence. "[T]he jury remains at liberty to reject voice identification evidence for any number of reasons, including a view that the spectrographic voice identification technique itself is either unreliable or misleading."¹²¹

Outside the procedural safeguards¹²² at trial, the spectrographic evidence may be excluded, under most state rules of evidence, on grounds that its prejudicial impact outweighs its probative value or that the evidence would confuse or mislead the jury.¹²³ It has been suggested that

[i]f the only evidence available concerning the identity of a speaker is a spectrogram, and if the crime alleged consists entirely in the speaking itself, the court should exclude the evidence, since the

116. *Id.* at 529.

117. *See* text accompanying notes 25-28 & 121.

118. *Law*, 40 Cal. App. 3d at 79, 114 Cal. Rptr. at 715.

119. Note, *supra* note 13, at 1167.

120. Siegel, *supra* note 20, at 531. Dr. Tosi stated that listening to the voice exemplars is necessary, although he failed to offer evidence or data concerning how listening improved the reliability of the analysis. *Id.*

121. *Williams*, 4 Ohio St. 3d at ___, 446 N.E.2d at 448. The jury instruction was given in general terms of weight to be given to the testimony of experts, taking into consideration the expert's skill, experience, knowledge, veracity and familiarity with the facts of the case. *Id.* at ___ n.7, 446 N.E.2d at 448 n.7. The jury instruction in *Baller*, 519 F.2d at 467 was phrased explicitly in terms of voice spectrography.

122. *Baller*, 519 F.2d 463, also outlined procedural safeguards; *see supra* notes 86-88 and accompanying text.

123. *FED. R. EVID.* 403.

spectrogram would be the only evidence presented and would point conclusively to guilt or innocence in that case. Such a case would make the spectrogram more than a tool for identification, since the case would turn on that alone.¹²⁴

III. ADMISSIBILITY OF VOICEPRINT EVIDENCE IN VIRGINIA

The use of scientific evidence in the courts of Virginia can be found as early as 1879, when the court in *Dean v. Commonwealth*¹²⁵ allowed a comparison of firearms to determine if the balls fired from them were similar in size to the slug found in the victim's body. Today, the use of scientific evidence and accompanying expert testimony in the courts of Virginia has "reached a significant level . . . In fact, Virginia trial courts have displayed a willingness to explore the uses of certain investigative techniques not generally recognized elsewhere."¹²⁶

Indeed, voiceprint evidence was admitted in an obscene telephone call prosecution in Hanover County in 1977.¹²⁷ Expert witnesses for the prosecution were Dr. Oscar Tosi¹²⁸ and Fred Lundgren.¹²⁹ The defendant's challenges to Dr. Tosi's credentials and the reliability of the voiceprint method were unsuccessful.¹³⁰ The voiceprint evidence was corroborative in nature with other evidence, including the victim's identification of the defendant's voice in a voice line-up.¹³¹ The defendant in *Saunders* did not appeal his conviction, however, and the absence of a trial record makes the case of little guidance to the use of voice spectrography in Virginia trial courts. The Virginia Supreme Court has not yet considered

124. Comment, *supra* note 11, at 234.

125. 73 Va. (32 Gratt.) 912 (1879).

126. C. FRIEND, *LAW OF EVIDENCE IN VIRGINIA* § 172 (2d ed. 1983). One of the best examples of Virginia's willingness to admit novel evidence is *Epperly v. Commonwealth*, 224 Va. 214, 294 S.E.2d 882 (1982). In *Epperly*, the court allowed dog tracking evidence after the laying of a proper foundation of both the handler's qualifications and the dog's training and abilities. Objections as to the track's staleness or contamination, or to the inexperience of the handler, go to the weight of the evidence. *Id.* at 232-33, 294 S.E.2d at 893.

However, it has been argued that dog scenting evidence does not hinge upon some scientific principle, but rather upon the handler's opinion and credibility; thus, the rules for admission of scientific evidence do not apply. *State v. Roscoe*, No. 5831, (Ariz. Dec. 28, 1984).

127. *Commonwealth v. Saunders* (Hanover County General Dist. Ct. Apr. 1977). The defense attorney was D. Dohnal of Richmond, Virginia.

128. Dr. Tosi is a professor at Michigan State University and director of the University's Speech & Hearing Sciences Research Laboratory and Institute of Voice Identification.

129. Mr. Lundgren was the spectrographic examiner in the case.

130. Telephone conversation with D. Dohnal, Apr. 23, 1985.

131. *Id.*

the admissibility of voiceprint evidence.

Two observations about scientific evidence in Virginia may be instructive in considering the admissibility of voice spectrography in Virginia trial courts. First, " 'scientific' evidence is nothing more than an extension of the long-accepted principle that an expert, having made an examination, may testify as to his opinion concerning the results of his investigation."¹³² Second, the courts and the leading authorities on evidence have declined to endorse any particular test for determining that a technique is "scientific."¹³³ On one hand, this could mean that, in Virginia, scientific evidence is admitted through expert testimony, and the critical question will be whether the witness is in fact an expert. If he is an expert, then his testimony—his scientific evidence—is admissible. However, expert testimony will not be admitted if the results of the "scientific testing" have not been proven to be scientifically reliable.¹³⁴ What emerges from Virginia case law, then, is a two-part analysis, more akin to the relevancy and reliability standards employed by some courts¹³⁵ than to the *Frye* rule.¹³⁶ First, the witness must be qualified as an expert; second, the scientific testing must be established as reliable. If both inquiries are affirmatively established, a final evidentiary consideration is whether the expert opinion is admissible under relevancy standards.¹³⁷

The first inquiry centers upon the witness' qualifications—his knowledge, skill and experience; the "question of the qualifications of a witness to speak as an expert lies largely in the discretion of the trial court."¹³⁸ In Virginia, no formal education is necessary; the only requirements are that the witness have "sufficient knowledge of his subject to give value to his opinion"¹³⁹ and that he be better qualified than the jury to form an inference from the facts.¹⁴⁰ It would appear that this rather low level of expertise would enable most voice spectrographic examiners to qualify as ex-

132. C. FRIEND, *supra* note 126, § 172.

133. See generally C. FRIEND, *supra* note 126.

134. See, e.g., *Skinner v. Commonwealth*, 212 Va. 260, 262, 183 S.E.2d 725, 727 (1971) (polygraph); *Orange v. Commonwealth*, 191 Va. 423, 61 S.E.2d 267 (1950) (truth serum).

135. See *supra* notes 73-93 and accompanying text.

136. See *supra* notes 54-72 and accompanying text.

137. See *supra* notes 99-102 and accompanying text.

138. *Jordan v. Commonwealth*, 207 Va. 591, 598, 151 S.E.2d 390, 395 (1966) (quoting *Ames & Webb, Inc. v. Commercial Laundry*, 204 Va. 616, 621, 133 S.E.2d 547, 550 (1963)); see also C. FRIEND, *supra* note 126, § 215.

139. *Norfolk & W. Ry. v. Anderson*, 207 Va. 567, 571, 151 S.E.2d 628, 631 (1966).

140. C. FRIEND, *supra* note 126, § 215.

perts; however, the fact that a witness considers himself an expert is not sufficient to qualify him as one.¹⁴¹

Establishing the reliability of the voice spectrographic method will be the most difficult hurdle to overcome in an attempt to admit the results of spectrographic analysis into evidence. In *Orange v. Commonwealth*,¹⁴² the results of a truth serum test were not admitted because there was "no evidence with respect to the value or the reliability of the tests."¹⁴³ The court failed to give any guidance as to what standards of reliability must be met for a novel scientific method to be admissible as evidence.¹⁴⁴ It is noteworthy, however, that at no time has the Virginia court adopted the *Frye* test of admissibility. Presumably the reliability of a novel scientific technique may be established by expert testimony.

The fact that other experts have reached different conclusions should not render the evidence inadmissible.¹⁴⁵ However, it is foreseeable that a "battle of the experts" may occur in the effort to establish reliability of the voice spectrographic method in Virginia. The Virginia court appears to acknowledge the same concept as the Massachusetts court does, that "neither infallibility nor unanimous acceptance of the [scientific] principle need be proved to justify its admission into evidence."¹⁴⁶ The Virginia court, then, if provided with proper experts, and upon a showing of reliability of the method, will find that voice spectrographic evidence is admissible if it is relevant and will probably aid the trier of fact.

Counsel advocating the admission of voiceprint evidence in Virginia may point out that some courts at first declined to admit such evidence on the theory that it had not been adequately tested under field conditions and was therefore unreliable. At least two of these courts have reversed their holdings or expressed a willingness

141. *Id.*; see also *Maxwell v. McCaffrey*, 219 Va. 909, 912, 252 S.E.2d 342, 344-45 (1979) ("The expressed belief of a witness that he is an expert does not *ipso facto* require his qualification.").

142. 191 Va. 423, 61 S.E.2d 267 (1950).

143. *Id.* at 439, 61 S.E.2d at 274.

144. 191 Va. 423, 61 S.E.2d 267; see also *Skinner*, 212 Va. 260, 183 S.E.2d 725; *Barber v. Commonwealth*, 206 Va. 241, 249-51, 142 S.E.2d 484, 490-92 (1965); *Lee v. Commonwealth*, 200 Va. 233, 237, 105 S.E.2d 152, 154-55 (1958). See *supra* text accompanying notes 99 & 100 for standards adopted by other courts.

145. *Walrod v. Matthews*, 210 Va. 382, 389, 171 S.E.2d 180, 185 (1969).

146. *Commonwealth v. Lykus*, 367 Mass. 191, —, 327 N.E.2d 671, 675 (1975); see also *Moenssens*, *supra* note 32, at 566.

to reconsider their earlier views,¹⁴⁷ particularly in light of the 1971 study conducted by Dr. Tosi.¹⁴⁸ In admitting voiceprint evidence to corroborate voice identification, the Florida Fourth District Court of Appeals noted that "impressive scientific data ha[d] been amassed as to the voiceprint's reliability" in the early 1970's.¹⁴⁹

Finally, counsel in Virginia seeking to admit voiceprint evidence should point out that the use of the evidence can be adequately safeguarded.¹⁵⁰ As the Fourth Circuit Court of Appeals has pointed out, "[u]nless an exaggerated popular opinion of the accuracy of a particular technique makes its use prejudicial or likely to mislead the jury, it is better to admit relevant scientific evidence in the same manner as other expert testimony and allow its weight to be attacked by cross-examination and refutation."¹⁵¹

IV. CONCLUSION

Even now, voice spectrography may be in that "twilight zone" referred to in *Frye v. United States*¹⁵² wherein "the evidential force of the [scientific] principle must be recognized."¹⁵³ In time, voice spectrography may gain the indicia of reliability which will allow it to be admitted in courts across the country.¹⁵⁴ Only three

147. Courts in California and New Jersey now admit such evidence when they formerly did not. Compare *People v. King*, 266 Cal. App. 2d 437, 72 Cal. Rptr. 437 (1968) and *State v. Cary*, 56 N.J. 16, 264 A.2d 209 (1970) (not admissible) with *Hodo v. Superior Court* 30 Cal. App. 3d 778, 106 Cal. Rptr. 547 (1973) and *State v. Andretta*, 61 N.J. 544, 296 A.2d 644 (1972) (admissible).

Dr. Peter Ladefoged, a professor of phonetics and an authority in the field of acoustical phonetics, was originally critical of Kersta's studies and the use of voice spectrography as a means of speaker identification. Siegel, *supra* note 20, at 536. However, after reading Dr. Tosi's 1971 study, Dr. Ladefoged professed a "new-found respect for 'voiceprint' identification." *United States v. Raymond*, 337 F. Supp. 641, 644-45 n.23 (D.D.C. 1972), *aff'd sub nom.* *United States v. Addison*, 498 F.2d 741 (D.C. Cir. 1974); see also *Lykus*, 367 Mass. at ___ n.3, 327 N.E.2d at 676 n.3 (discussing Dr. Ladefoged's change of opinion regarding identification by the spectrographic method).

148. See *Experiment in Voice Identification*, *supra* note 43; see also *Lykus*, 367 Mass. at ___ n.2, 327 N.E.2d at 675 n.2. See *supra* note 79 for a list of variables tested in the Tosi study.

149. *Worley v. State*, 263 So. 2d 613, 614 (Fla. Dist. Ct. App. 1972).

150. See *supra* notes 107-20 and accompanying text.

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

152. 293 F. 1013 (D.C. Cir. 1923).

153. *Id.* at 1014.

154. In a recent case, the Supreme Court of North Carolina noted that the passage of time can serve to demonstrate the reliability of scientific phenomena: "the novelty of a chosen technique does not justify rejecting its admissibility into evidence." *State v. Bullard*, 312

years ago, the Third Circuit Court of Appeals held that a defendant's sixth amendment right to effective assistance of counsel was violated when his attorney failed to investigate potentially exculpatory evidence, when the evidence consisted of the defendant's voice exemplar and the government's intercepted recording.¹⁵⁵ If its reliability is not universally accepted, at least voice spectrography has established itself as a force to be reckoned with in the field of scientific evidence.

N.C. 129, ___, 322 S.E.2d 370, 380 (1984) (footprint identification testimony by a physical anthropologist admitted in a murder trial).

Nor should it be overlooked that voice spectrography has implications beyond use at trial. Courts have allowed its use at probation revocation hearings, *United States v. Sample*, 378 F. Supp. 44 (E.D. Pa. 1974), and in probable cause hearings, *State ex rel. Trimble v. Hedman*, 291 Minn. 441, 192 N.W.2d 432 (1971). In *Trimble*, unknown to the suspect, a recording was made of her voice while she discussed welfare payments. The sole purpose of the recording was to produce a voiceprint; the voiceprint led to her arrest, and was admitted at the probable cause hearing. *Id.* at ___, 192 N.W. 2d at 433-34. Thus, voice spectrography has value as an investigative aid.

155. *United States v. Baynes*, 687 F.2d 659 (3d Cir. 1982). For a further discussion of the constitutional implications of voice spectrography, see Deckler & Handler, *Voiceprint Identification Evidence—Out of the Frye Pan and Into Admissibility*, 26 AM. U.L. REV. 314, 365-71 (1977) (noting that the manner in which the exemplar is procured and the identification process itself may give rise to constitutional questions, but that due process is probably not offended by the taking of the voiceprint or its analysis); Note, *supra* note 13, at 1173-74.