Voiceprints in the Courtroom—Scientific and Evidentiary Problems

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The admissibility in criminal cases of evidence concerning voiceprints, or spectrographic analysis of the voice for identification, is an issue that continues to be debated.[1] Although some commentators have written of a "trend" in the courts toward admitting evidence of spectrographic voice identification,[2] recent case law suggests that such an evaluation may have been premature. Some recent decisions have refused to admit voiceprint evidence because of the persisting scientific and legal controversies surrounding the spectrographic technique.[3] Voice spectrography rests on the propositions that each individual's voice is unique, and that a voice's unique characteristics can be distinguished in a graphic representation called a spectrogram.[4] Opponents of the spectrographic method of identification maintain that spectrography has not been established as a reliable technique for recording the acoustical features of a voice or distinguishing one person's voice from another's.[5]

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1. *Compare* United States v. Addison, 498 F.2d 741, 744-45 (D.C. Cir. 1974) *and* Reed v. State, 283 Md. 374, 382-87, 391 A.2d 364, 368-72 (1978) (both holding spectrographic voice analysis inadmissible) *with* United States v. Williams, 583 F.2d 1194, 1198-1200 (2d Cir. 1978), *cert. denied*, 439 U.S. 117 (1979) *and* Commonwealth v. Lykus, 367 Mass. 191, 204-05, 327 N.E.2d 671, 678-79 (1975) (admitting such evidence).

2. *See, e.g.*, Decker & Handler, *Voiceprint Identification Evidence—Out of the Frye Pan and Into Admissibility*, 26 AM. U. L. REV. 314, 350, 354 (1977); Comment, *Evidentiary Use of the Voice Spectrograph in Criminal Proceedings*, 77 MIL. L. REV. 167, 187 (1977); Note, *Voiceprint Identification: The Trend Towards Admissibility*, 9 NEW ENGLAND L. REV. 419, 419, 430-31 (1974).

3. *See, e.g.*, United States v. McDaniel, 538 F.2d 408, 413 (D.C. Cir. 1976); People v. Kelly, 17 Cal. 3d 24, 28, 549 P.2d 1240, 1242, 130 Cal. Rptr. 144, 146 (1976); Reed v. State, 283 Md. 374, 397-400, 391 A.2d 364, 376-77 (1978); People v. Tobey, 401 Mich. 141, 147, 257 N.W.2d 537, 540 (1977).

4. *See, e.g.*, United States v. Baller, 519 F.2d 463, 465 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975); People v. Law, 40 Cal. App. 3d 69, 76, 114 Cal. Rptr. 708, 712 (1974); Kersta, *Speaker Recognition and Identification by Voiceprints*, 40 CONN. B.J. 586, 589-91 (1966); Comment, *Voiceprints—The Admissibility Question: What Evidentiary Standard Should Apply?* 19 ST. LOUIS UNIV. L.J. 509, 511 (1975).

5. *See, e.g.*, United States v. Addison, 498 F.2d 741, 744 (D.C. Cir. 1974); People v. Kelly, 17 Cal. 3d 24, 28, 549 P.2d 1240, 1242, 130 Cal. Rptr. 144, 146 (1976); People v. King, 266 Cal. App. 2d 437, 461, 72 Cal. Rptr. 478, 493 (1968); Bolt, Cooper, David, Denes, Pickett & Stevens, *Speaker Identification by Speech Spectrograms: A Scientists' View of its Reliability for Legal Purposes*, 47 J. ACOUS. SOC'Y AM. 597, 602-03 (1970) [hereinafter cited as Bolt].

To properly evaluate the claims of accurate identification made by voice spectrographers and the objections raised by other acoustical scientists, the practicing attorney should have some knowledge of the mechanical operation of the voice spectrograph machine. Accordingly, this Note will present a detailed description of the technique of voice spectrography and an outline of the debate among acoustical scientists as to its accuracy. The current law concerning spectrographic evidence will then be reviewed, including an analysis of several recent cases. The three evidentiary standards courts have used to determine admissibility will be examined: The Frye standard, which was first applied to lie detector evidence; the Williams standard, which is a recent modification of Frye; and the McCormick standard, which is embodied in the Federal Rules of Evidence and the state rules patterned after them. This analytical paradigm is intended to highlight the effect that a choice among these legal standards will have upon whether evidence of spectrographic voice identification is to be admitted. Finally, the McCormick standard will be presented as the most appropriate standard for determining the admissibility of spectrographic evidence, because that standard encompasses adequate evidentiary safeguards without the added requirements imposed by the other two, and has been consistently applied to most other types of scientific evidence.

THE MECHANICS OF SPEECH AND THE SPECTROGRAPH MACHINE

Spectrographic voice analysis rests on the assumptions that each voice is unique, that the spectrograph machine accurately reflects and displays this uniqueness, and that an examiner can accurately identify a voice on the basis of subjective comparisons of spectrograms.[6] Intelligible speech is the product of a complex physiological and mechanical operation.[7] This operation is not significantly altered after puberty, and cannot be disguised or changed by mimicry, illness, passage of time, or foreign objects in the speaker's mouth.[8] It is claimed that individuals differ in the size and shape of the oral and nasal cavaties and in the structure of the larynx, and in the particular but stable habit pat-

6. *See, e.g.*, People v. Law, 40 Cal. App. 3d 69, 76-77, 114 Cal. Rptr. 708, 712-13 (1974); Kersta, *supra* note 4, at 591; Comment, *supra* note 4, at 511.

7. *Kersta, supra* note 4, at 591. *See* People v. King, 266 Cal. App. 2d 437, 449, 72 Cal. Rptr. 478, 486 (1968).

8. Kersta, *supra* note 4, at 589. *See* People v. King, 266 Cal. App. 2d 437, 449, 72 Cal. Rptr. 478, 486 (1968). Other scientists, however, maintain that the precise spectrographic effects of mimicry and disguise are still unknown. *See* Bolt, *supra* note 5, at 601. Even if all voice qualities, or even the major qualities, are immutable, the question remains whether a voice can be changed sufficiently to confuse identification methods when a spectrogram of a suspect's voice is compared to the spectrogram of an unknown voice. *See* People v. Law, 40 Cal. App. 3d 69, 79 & n.9, 114 Cal. Rptr. 708, 715-16 & n.9 (1974); Bolt, *Speaker Identification by Speech Spectrograms: Some Further Observations*, 54 J. ACOUS. SOC'Y AM. 531, 532 (1973) [hereinafter cited as Bolt II]; text & notes 85-87 *infra*.

terns in which they use this vocal apparatus.[9] Both of these factors affect speech spectrograms.[10] Dr. Oscar Tosi, who has conducted the leading experiments in spectrographic voice identification, admits that two spectrograms made by the same person speaking the same words on two different occasions will not be identical, since variations occur even in one person's repeated pronunciation of the same sound.[11] He insists, however, that the difference between the spectrograms made by the same person—"intraspeaker variability"—is never as great as the difference between spectrograms made by two different people—"interspeaker variability."[12] Spectrographic identification, then, assumes that the combination of these many factors produces a spectrogram different from those of all other speakers, so that the speaker in question is uniquely characterized. By comparing the spectrogram from a known speaker with one from an unknown speaker, the spectrographic examiner may be able to conclude that the two voices were from the same individual (identification) or were spoken by different persons (exclusion).[13]

The basis for the claim of voice uniqueness is grounded in the speech mechanism.[14] The factors determining the distinctiveness of a voiceprint are the shape of the vocal cavities and articulators and their positioning during speech.[15] Speech begins with the exhalation of air past the vocal cords.[16] The sound produced by the vocal cords' vibration is modified by the particular anatomical structure of the throat and the nasal and oral cavities,[17] as well as by the ways in which the articulators are manipulated during speech.[18] As a result, the peaks, or formants,[19] in the spectrogram are affected by at least three factors: the

9. Bolt, *supra* note 5, at 604.

10. *Id.*

11. Tosi, Oyer, Lashbrook, Pedrey, Nicol, & Nash, *Experiment on Voice Identification*, 51 J. ACOUS. SOC'Y AM. 2030, 2030-31 (1972) [hereinafter cited as Tosi]. *See* People v. Law, 40 Cal. App. 3d 69, 78, 114 Cal. Rptr. 708, 714 (1974).

12. Tosi, *supra* note 11, at 2030-31; People v. Law, 40 Cal. App. 3d 69, 78, 114 Cal. Rptr. 708, 714 (1974).

13. *See* Bolt, *supra* note 5, at 604; Comment, *supra* note 4, at 511; United States v. Baller, 519 F.2d 463, 465 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975).

14. Jones, *Evidence Vel Non: The Non Sense of Voiceprint Identification*, 62 KY. L.J. 301, 303 (1974); Kersta, *supra* note 4, at 591.

15. Kersta, *supra* note 4, at 591. The articulators are the lips, teeth, tongue, soft palate, and jaw muscles, the interplay of which results in intelligible speech. Bolt, *supra* note 5, at 604; Kamine, *The Voiceprint Technique: Its Structure and Reliability*, 6 SAN DIEGO L. REV. 213, 223, 225 (1969); Comment, *supra* note 4, at 511.

16. Kamine, *supra* note 15, at 223.

17. *Id.*; Kersta, *supra* note 4, at 591; Comment, *supra* note 4, at 511.

18. Jones, *supra* note 14, at 303; Kamine, *supra* note 15, at 223, 225; Kersta, *supra* note 4, at 591. *See* United States v. Williams, 583 F.2d 1194, 1196-97 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); People v. King, 266 Cal. App. 2d 437, 449-50, 72 Cal. Rptr. 478, 486 (1968).

19. "Formants" are the sound frequencies that are emphasized when a word is spoken. The term also designates the peaks on the spectrogram, which are the graphic representations of those frequencies. *See* Bolt, *supra* note 5, at 597-98, 603; Kamine, *supra* note 15, at 223.

speaker's bodily dimensions that set him apart from other speakers, the speaker's dialect, and the speaker's particular methods of matching the norms of that dialect.[20] The improbability that two speakers would have vocal cavities of the same size and would use the articulators identically is the basis for the claim that each voice is unique.[21]

The spectrograph machine is a tool for analyzing speech sounds and representing how they vary from instant to instant.[22] It maps a spectrum of the frequency and intensity of each overtone of the speech wave.[23] It does not, however, analyze voice pitch[24] as one of the factors essential to identification.[25]

The process of analyzing a recorded voice with a spectrograph involves a three-stage process. First, the examiner listens to the recordings of a known voice and an unknown voice and selects similar words and phrases which are cut from the "unknown" tape and placed around a drum on the spectrograph.[26] For an effective analysis, there must exist a sufficient number of words or phrases common to both tapes such that a valid comparison may be made.[27] The words most often chosen for comparison are "the, to, and, me, on, is, you, I, it, and a," because of their frequent occurrence in the English language.[28] If there are not sufficient whole words for comparison, parts of words, consonants, or vowels common to both tapes are used.[29]

As the spectrograph's drum rotates, a magnetic head repeatedly scans the tape of the unknown voice, recording a different band of frequencies at each scanning.[30] The electronic signals created by these consecutive scannings are passed through analyzing filters.[31] These signals then trigger a stylus which plots the frequency, intensity, and time

20. Bolt, *supra* note 5, at 604.

21. Jones, *supra* note 14, at 303; Kamine, *supra* note 15, at 225-26; Kersta, *supra* note 4, at 591; Comment, *supra* note 4, at 511. *See* People v. Law, 40 Cal. App. 3d 69, 77, 114 Cal. Rptr. 708, 713 (1974). The difficulty of analyzing the several components of a speech sound and determining precisely which characteristics distinguish a voice as unique is discussed in text & notes 48-54, 85-87 *infra*.

22. Jones, *supra* note 14, at 303; Comment, *supra* note 4, at 510.

23. Jones, *supra* note 14, at 303; Kamine, *supra* note 15, at 223.

24. Voice pitch is the high or low tone of a voice, as it sounds to the ear. The spectrograph measures pitch only in its component parts, the frequency and intensity of the speech wave. *See* Jones, *supra* note 14, at 303; Kamine, *supra* note 15, at 223.

25. People v. King, 266 Cal. App. 2d 437, 448, 72 Cal. Rptr. 478, 485 (1968).

26. *Id.* at 447-48, 72 Cal. Rptr. at 485; Jones, *supra* note 14, at 303; Tosi, *supra* note 11, at 2032; Comment, *supra* note 4, at 510.

27. People v. King, 266 Cal. App. 2d 437, 448, 72 Cal. Rptr. 478, 485 (1968).

28. Jones, *supra* note 14, at 303; Kersta, *supra* note 4, at 586; Comment, *supra* note 4, at 511. *See* Tosi, *supra* note 11, at 2033.

29. People v. King, 266 Cal. App. 2d 437, 448, 72 Cal. Rptr. 478, 485 (1968).

30. *Id.*; Jones, *supra* note 14, at 303; Kamine, *supra* note 15, at 220; Comment, *supra* note 4, at 510.

31. Jones, *supra* note 14, at 303; Kamine, *supra* note 15, at 220; Comment, *supra* note 4, at 510.

characteristics[32] of the voice in successive rows of closely-spaced dots by sparking the dots on electrosensitive facsimile paper.[33] The intensity of the signal at a particular frequency is plotted over time on the horizontal (time) axis of the spectrogram.[34] The successive scannings at various frequencies proceed upward on the spectrogram along the verticle (frequency) axis.[35] The completed spectrogram, a graphed pattern of closely spaced horizontal lines read from left to right, constitutes a "picture" of the spoken words.[36]

The second part of the voiceprint analysis technique relies upon a pattern-matching process.[37] Since a voiceprint may vary merely because of the duration of a sound, aside from the sound's essential acoustical features, the examiner excludes the effect of duration in matching the spectrograms of the known and the unknown voices.[38] He compares the spectrograms along the horizontal time axis, noting significant points of similarity in intensity patterns, widths, shapes, slopes, and the patterns indicating the pronunciation of consonants.[39] The examiner in a voiceprint analysis disregards points of dissimilarity because these are assumed to represent intraspeaker variability, and seeks only comparable points between the spectrograms.[40] Although authorities differ as to how many points of similarity are required in order to conclude that the known and unknown voices are that of the same speaker, an examiner may generally conclude that the two spectrograms are a match if he finds ten to twenty comparable points.[41] Finally, the examiner again listens to the tape recordings to observe some speech characteristics better recognized by the ear than the spectrograph to confirm his conclusion.[42]

32. The completed spectrogram includes an analysis of the timing of a person's speech: whether it is slow or fast; where the speaker pauses; and which parts of words or phrases the speaker shortens or draws out. *See* Jones, *supra* note 14, at 303; Kamine, *supra* note 15, at 220; Comment, *supra* note 4, at 510; text & notes 38-39 *infra*.

33. Bolt, *supra* note 5, at 605; Kamine, *supra* note 15, at 220; Comment, *supra* note 4, at 510; text & notes 38-39 *infra*.

34. Bolt, *supra* note 5, at 605. *See* People v. King, 266 Cal. App. 2d 437, 448, 72 Cal. Rptr. 478, 485 (1968).

35. People v. King, 266 Cal. App. 2d 437, 448, 72 Cal. Rptr. 478, 485 (1968).

36. *Id.*

37. Kamine, *supra* note 15, at 214-15.

38. *Id.* at 215-16.

39. People v. King, 266 Cal. App. 2d 437, 449, 72 Cal. Rptr. 478, 485 (1968). Sudden changes in the frequency pattern indicate the points where consonants and vowels join in the recorded speech. Bolt, *supra* note 5, at 597.

40. Kamine, *supra* note 15, at 216; Tosi, *supra* note 11, at 2031.

41. Jones, *supra* note 14, at 304; Kamine, *supra* note 15, at 216; Comment, *supra* note 4, at 511. *See* United States v. Williams, 583 F.2d 1194, 1198 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); People v. Law, 40 Cal. App. 3d 69, 79 n.10, 114 Cal. Rptr. 708, 715 n.10 (1974); Reed v. State, 283 Md. 374, 379-80, 391 A.2d 364, 367 (1978).

42. *See* People v. Law, 40 Cal. App. 3d 69, 76, 114 Cal. Rptr. 708, 712 (1974). Thus, an element of subjectivity is involved in spectrographic analysis. *See* text & notes 156-58 *infra*.

THE SCIENTIFIC DEBATE

Spectrographic voice analysis has long been used for classification of human speech sounds, but it had not been employed for the more specific task of identification until the early 1960's when Lawrence Kersta[43] developed the technique for this special purpose.[44] Observing that interspeaker variations were always more numerous than intraspeaker variations in the spectrograms, he concluded that the technique was reliable for identification.[45] In 1962 he published the results of some experiments he performed, reporting less than one percent error of false identification.[46] As a result, Kersta claimed that identifications made through spectrographic analysis are as accurate as fingerprint identifications.[47]

Other scientists, however, were doubtful. In 1970, Richard H. Bolt and five other members of the Acoustical Society of America published a report that reviewed voice spectrography from a scientific standpoint and evaluated its usefulness for personal identification in the courts.[48] They first addressed some of the difficulties inherent in the spectrographic process.[49] The authors claimed that there is no clear understanding of which spectrographic patterns are likely to be invariant for a given speaker, nor which patterns are most likely to vary among different speakers.[50] Uncertainties would thus arise as to whether prominent similarities indicate that the same speaker twice pronounced the word pictured on the spectrograms, or whether the same word was pronounced by two different speakers.[51] Differences, on the other hand, might indicate different speakers, or merely variation in the speech of a

43. Kersta was employed at the research laboratory of Bell Telephone Laboratories for nearly 40 years before he retired in 1966 to manufacture and sell his own voiceprint machines and to operate his own voiceprint laboratory. People v. King, 266 Cal. App. 2d 437, 446, 72 Cal. Rptr. 478, 484 (1968).

44. State v. Williams, 388 A.2d 500, 501-02 (Me. 1978); Tosi, *supra* note 11, at 2031.

45. Tosi, *supra* note 11, at 2031.

46. *Id.* Since 1962, Kersta has testified in many trials about the technique itself and its reliability. He has also been offering training in its use to law enforcement officers. *Id.*

47. Kersta, *supra* note 4, at 589. *See* Jones, *supra* note 14, at 318. *See also* text & notes 175-82 *infra*. Because a person's fingerprint patterns are determined by heredity, do not change throughout one's life, and cannot easily be counterfeited or disguised, and because fingerprint analysis involves direct comparison of actual, physical ridges on the skin, fingerprint identification is regarded as extremely accurate. *See generally* Bolt, *supra* note 5, at 599-600; Decker & Handler, *supra* note 2, at 360-61; Jones, *supra* note 14, at 318-19. It must be noted, however, that Kersta's education and employment experience were confined to the areas of engineering and instrument design, and that his work on the voiceprint machine was his only endeavor in the area of acoustical analysis. *See* People v. King, 266 Cal. App. 2d 437, 446, 456, 72 Cal. Rptr. 478, 484, 489 (1968). His qualifications to evaluate the accuracy of the machine must be considered in light of this background.

48. Bolt, *supra* note 5, *passim*.

49. *Id.* at 598.

50. *Id.* at 599, 602.

51. *Id.* at 598.

single speaker.[52] In addition, Bolt explained that there is no code of spectrographic patterns that corresponds to any certain set of speech characteristics.[53] Thus, the task of recognizing the patterns that reflect the characteristics particularly identifying the speaker's voice is more complex than Kersta had indicated.[54]

Bolt then evaluated the accuracy of the technique based upon experiments performed up to the date of his writing.[55] In matching experiments performed by several scientists, the examiners identified spectrograms of single "unknown" speakers by matching them against spectrograms of "known" speakers who all spoke the same test words.[56] In Kersta's experiments, where isolated words spoken by an "unknown" speaker were matched against isolated words spoken by known speakers, the error rate was only one percent.[57] In an experiment conducted by M.A. Young and R.A. Campbell,[58] however, where words spoken in sentence context by an unknown speaker were matched against words spoken in isolation by the known speakers, the error rate was sixty-three percent.[59] In further experiments by the same scientists, spectrograms from unknown speakers, whose voices were not included among the known speakers, were matched against a catalog of eight known speakers.[60] By visual examination of the spectrograms alone, not including comparison by listening, thirty-one to forty-seven percent of the unknown speakers were incorrectly identified as belonging to the catalog of known speakers.[61] From these wide differences in error rate, Bolt determined that voice identification experiments depend strongly on the experimental conditions, rather than on differences in voice characteristics.[62] He concluded that a reliable machine method of voice identification had not been formulated.[63]

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52. *Id.* at 599, 602.
53. *Id.*
54. *Id.*
55. *Id.* at 600-01, 603.
56. *Id.* at 600.
57. *Id.*
58. *See generally* Young & Campbell, *Effects of Context on Talker Identification*, 42 J. ACOUS. SOC'Y AM. 1250 (1967).
59. Bolt, *supra* note 5, at 600. In each of Young & Campbell's experiments, the unidentified speaker's voice was one of the voices in the catalog, or pool, of "known," or identified, speakers.
60. *Id.* at 601.
61. *Id.*
62. *Id.* The experimental conditions referred to by Bolt are the procedures and instrumentation, the experience of the examiners, and the speaking conditions under which the voice samples were taken. *Id.*
63. *Id.* at 603. Bolt cast further doubt on the relevancy of these early voice identification experiments in criminal trials by pointing out the experiments' dissimilarity to real life situations. *Id.* at 601. In the experimental setting, there was a limited number of known speakers against which the unknown spectrogram was compared. *Id.* In the practical application of the technique, there is only one known speaker—the suspect—and the unknown sample is drawn from an indefinitely large and unidentified pool of speakers, the general public. *Id.* Either of these factors

In response to this report, Dr. Oscar Tosi[64] and five of his colleagues conducted an extensive experiment on the technique at Michigan State University from 1968 to 1970.[65] The experiment tested only visual examination of the spectrograms, excluding aural comparison so that the accuracy of the spectrographic technique itself could be more closely monitored.[66] Seven variables were tested in the Tosi experiment: the number of clue words used for identification; the number of utterances of each clue word; the type of recording condition—noisy or quiet, direct recording or recording through a telephone line; the context of the clue words—spoken in isolation, in a fixed context, and in random context; the number of known speakers against whom the unknown spectrograms were to be matched; the time lapse between recordings of the same voice; and the awareness on the part of the examiners as to whether the unknown voice was represented in the catalog of known speakers.[67] Two hundred and fifty speakers were randomly selected from a homogeneous population of 25,000 male students at Michigan State University.[68] Trained examiners were given a total of nearly 35,000 trials of identification.[69] One-third of these trials were "closed," in which the examiners were told that the unknown speaker was among the known; one-third were "open-match," in which the examiners did not know whether the unknown speaker was among the known, but in fact the unknown did match one of the known; and one-third were "open-no-match," in which the examiners did not know whether a match existed, and in fact the unknown speaker did not match any of the known.[70]

The results of Tosi's experiment in the trials that are most relevant to forensic application—open trials with noncontemporary spectrograms of words spoken in fixed or random context—showed an error rate of approximately nineteen percent, composed of six percent incor-

might affect the reliability of the technique as presented by the experiments. *See id.* at 601; text & notes 80-84 *infra*.

64. Dr. Tosi is a professor of Audiology and Speech Sciences and Physics at Michigan State University. He holds a Ph.D. in Audiology and Speech Sciences and a Ph.D. in Engineering and Physics. He is a member of various professional societies and has published several books and numerous papers.

65. Tosi, *supra* note 11, *passim*.

66. *Id.* at 2033.

67. *Id.*

68. *Id. See* People v. Law, 40 Cal. App. 3d 69, 77, 114 Cal. Rptr. 708, 713 (1974); Commonwealth v. Lykus, 367 Mass. 191, 201, 327 N.E.2d 671, 676 (1975) (details of experiment developed through expert testimony). All of the speakers selected were of the same education and approximate age, spoke the same midwest dialect of general American English, and had no speech defects. Tosi, *supra* note 11, at 2033.

69. Tosi, *supra* note 11, at 2034-35. *See* People v. Law, 40 Cal. App. 3d 69, 77, 114 Cal. Rptr. 708, 713 (1974); Commonwealth v. Lykus, 367 Mass. 191, 201, 327 N.E.2d 671, 676 (1975).

70. Tosi, *supra* note 11, at 2033, 2035.

rect identifications and thirteen percent incorrect exclusions.[71] Tosi pointed out, however, that these percentages would be reduced to an error rate of approximately two percent incorrect identifications and five percent incorrect exclusions, if the examiners had been allowed to withhold their opinion when they were uncertain.[72] Tosi also claimed that the error would be reduced further in practical application of the technique.[73] In an actual case, a professional examiner makes the comparisons and listens to the tapes in addition to inspecting the spectrograms.[74] Furthermore, when the examiner is allowed to use as much time and as many samples as he needs, and need not express an opinion when he is in doubt, Tosi argued that the rate of misidentification would be negligible.[75]

Bolt and his associates published a letter in 1973 reviewing voiceprint experiments made by Tosi and other groups of scientists between 1970 and 1973.[76] Grouping Tosi's results to correspond more directly to the type of experimental trials he conducted, Bolt found a total of twenty-nine percent error for the open-match trials, composed of five percent incorrect identification and twenty-four percent incorrect exclusion.[77] In the open-no-match trials, Bolt recorded a two to five percent incorrect identification error for contemporary spectrogram matches and a five to ten percent misidentification for the noncontemporary matches.[78] Thus, in the types of trials considered to be most similar to situations found in criminal cases,[79] Bolt found experimental error rates much higher than those reflected in the Tosi report.

From the results of the experiments he reviewed, Bolt again concluded that practical application of the spectrographic method would increase rather than decrease the percentage of error.[80] Particularly significant to Bolt was the fact that increasing the number of persons in the catalog of known speakers sharply increased the rate of incorrect identification.[81] This result indicates that the error would further in-

71. *Id.* at 2039, 2041. *See* People v. Law, 40 Cal. App. 3d 69, 77, 114 Cal. Rptr. 708, 713 (1974); Commonwealth v. Lykus, 367 Mass. 191, 201, 327 N.E.2d 671, 676 (1975).

72. Tosi, *supra* note 11, at 2041. *See* People v. Law, 40 Cal. App. 3d 69, 78, 114 Cal. Rptr. 708, 713 (1974); Commonwealth v. Lykus, 367 Mass. 191, 201, 327 N.E.2d 671, 676 (1975).

73. Tosi, *supra* note 11, at 2041-42.

74. *Id. See* People v. Law, 40 Cal. App. 3d 69, 78, 114 Cal. Rptr. 708, 713-14 (1974); Hodo v. Superior Court, 30 Cal. App. 3d 778, 783, 106 Cal. Rptr. 547, 549 (1973); Decker & Handler, *supra* note 2, at 328.

75. Tosi, *supra* note 11, at 2041-42.

76. Bolt II, *supra* note 8.

77. *Id.* at 532.

78. *Id.* Other experiments noted by Bolt, conducted by Dr. B.M. Hazen, yielded even higher error rates. In open tests with clue words taken from conversation, there were 17% incorrect identifications and 67% incorrect exclusions. *Id.* at 533. *See generally* Hazen, *Effects of Differing Phonic Contexts on Spectrographic Speaker Identification*, 54 J. ACOUS. SOC'Y AM. 650 (1973).

79. Bolt II, *supra* note 8, at 532.

80. *Id.* at 532, 534.

81. *Id.* at 533.

crease when a larger population is used, as in an actual case, where one suspect would be drawn from the population of an entire city.[82] Bolt also criticized the Tosi report's lack of substantiation for the assertion that a professional examiner's error rate might decrease according to his degree of caution and use of aural comparisons.[83] Bolt emphasized that these error rates are extremely important in a criminal case, since erroneous identification relates to the possible conviction of an innocent person, while incorrect exclusion may halt investigation of a person who is actually guilty.[84]

Finally, Bolt pointed to several factors that were not analyzed in the Tosi study, but which could increase the probability of error.[85] Changes in the psychological state of a person, the subject's attempts at mimicry, and the spectrographic characteristics of women's voices are some problems Bolt claimed would require further study before voice spectrography could be established as a reliable identification tool.[86] Bolt concluded that the Tosi study provided no new understanding as to which spectrographic features correlated most accurately with the identifying characteristics of a person's voice.[87] Tosi had suggested that a person familiar with speech patterns and trained in reading spectrograms could probably correlate certain sounds and words with spectrographic patterns that appear to characterize them.[88] Tosi did not explain, however, how the examiner could use the correspondence he establishes between a particular word and a characteristic pattern to identify one person's pronunciation of a word, while distinguishing it from another's pronunciation of the same word.[89]

These articles seem to be regarded by the courts as the most authoritative review of the scientific evaluation of spectrographic analysis.[90] Debate continues in the scientific community as to the reliability

82. *Id.*

83. *Id.* The Tosi report presented no scientific data regarding the error rates of a professional examiner, but argued that the examiner could improve the accuracy of his determinations by taking more time at his task, using aural comparison, and by generally assuming the responsibility of a professional. Tosi, *supra* note 11, at 2042.

84. Bolt II, *supra* note 8, at 532.

85. *Id.* at 532-33.

86. *Id.*; *see* People v. Law, 40 Cal. App. 3d 69, 80, 83, 114 Cal. Rptr. 708, 715, 717 (1974). *But see* Kersta, *supra* note 4, at 591; text & notes 43-47 *supra*.

87. Bolt II, *supra* note 8, at 533.

88. *See generally* Tosi, *supra* note 11, at 2031.

89. Tosi does not explain how intraspeaker and interspeaker variability may be distinguished. *See id.* at 2030-31.

90. *See* People v. Law, 40 Cal. App. 3d 69, 81-82, 114 Cal. Rptr. 708, 716-17 (1974); Reed v. State, 283 Md. 374, 392-99, 391 A.2d 364, 373-76 (1978); Commonwealth v. Lykus, 367 Mass. 191, 199 n.3, 327 N.E.2d 671, 676 n.3 (1975); Commonwealth v. Topa, 471 Pa. 223, 232-33, 369 A.2d 1277, 1280-81 (1977). Tosi's reply to Bolt's second article, Black, Lashbrook, Nash, Oyer, Pedrey, Tosi & Truby, *Reply to "Speaker Identification by Speech Spectrograms: Some Further Observations,"* 54 J. ACOUS. SOC'Y AM. 535 (1973) [hereinafter cited as Black], is generally included as part of this authoritative review.

and accuracy of the technique and its acceptance by that community as a whole.[91] This debate is the scientific base on which the legal controversy concerning voiceprints rests.

THE LEGAL CONTROVERSY

The first legal question that must be addressed is the constitutionality of compelling an accused to speak, and hence, to produce identification evidence that can be used against him in a criminal proceeding.

It has been held that compelling an accused to submit voice exemplars for purposes of identification does not infringe upon his fifth amendment privilege against self-incrimination.[92] The United States Supreme Court has held that this privilege is limited to communications and to evidence that is testimonial in nature.[93] Compelling the accused to exhibit identifying physical characteristics, however, is not compulsion to give testimonial evidence.[94] Although the voice is a means of communication, speech patterns themselves are merely physical characteristics that distinguish the sound of one voice from another.[95] For this reason, the voice is often grouped with other types of

91. *See* United States v. Addison, 498 F.2d 741, 744-45 (D.C. Cir. 1974); People v. Kelly, 17 Cal. 3d 24, 33, 549 P.2d 1240, 1246, 130 Cal. Rptr. 144, 150 (1976); People v. Law, 40 Cal. App. 3d 69, 82-84, 114 Cal. Rptr. 708, 717-18 (1974); People v. King, 266 Cal. App. 2d 437, 454-58, 72 Cal. Rptr. 478, 489-92 (1968); State v. Williams, 388 A.2d 500, 501 (Me. 1978); Reed v. State, 283 Md. 374, 396-97, 391 A.2d 364, 375-76 (1978); Commonwealth v. Lykus, 367 Mass. 191, 193-96, 327 N.E.2d 671, 673-74 (1975).

92. *See* text & notes 93-99 *infra*. Moreover, the fourth amendment does not prohibit compelling an accused to submit to voice analysis. The United States Supreme Court held in Katz v. United States, 389 U.S. 347 (1967), that although what a person reasonably seeks to keep private is protected by the fourth amendment, what he knowingly exposes to the public is not within that guaranty. *Id.* at 351. Later, in United States v. Dionisio, 410 U.S. 1 (1973), the Court explicitly stated that a person's voice is constantly exposed to the public, and that "[n]o person can have a reasonable expectation that others will not know the sound of his voice." *Id.* at 14. *Accord*, People v. Ellis, 65 Cal. 2d 529, 535, 421 P.2d 393, 396, 55 Cal. Rptr. 385, 388 (1966); Reed v. State, 35 Md. App. 472, 493-94, 372 A.2d 243, 256-57 (1977).

93. Gilbert v. California, 388 U.S. 263, 266 (1967); Schmerber v. California, 384 U.S. 757, 761 (1966). *See also* Gilbert v. United States, 366 F.2d 923, 936 (9th Cir. 1966), *cert. denied*, 393 U.S. 985 (1968); People v. Ellis, 65 Cal. 2d 529, 533, 421 P.2d 393, 394, 55 Cal. Rptr. 385, 386 (1966); Reed v. State, 35 Md. App. 472, 491, 372 A.2d 243, 255-56 (1977).

94. United States v. Dionisio, 410 U.S. 1, 5-6 (1973); United States v. Wade, 388 U.S. 218, 222 (1967); United States v. Thomas, 586 F.2d 123, 133-34 (9th Cir. 1978); Reed v. State, 35 Md. App. 472, 491, 372 A.2d 243, 255 (1977). As the court noted in Gilbert v. United States, 366 F.2d 923, 936 (9th Cir. 1966), *cert. denied*, 393 U.S. 985 (1968), the prohibition against compulsory self-incrimination pertains to physical or moral compulsion to communicate knowledge of one's own guilt. It does not mandate exclusion of evidence of his physiological characteristics. 366 F.2d at 936.

95. Gilbert v. California, 388 U.S. 263, 266-67 (1967); United States v. Thomas, 586 F.2d 123, 133-34 (9th Cir. 1978); Gilbert v. United States, 366 F.2d 923, 937 (9th Cir. 1966), *cert. denied*, 393 U.S. 985 (1968); People v. Ellis, 65 Cal. 2d 529, 534, 421 P.2d 393, 395, 55 Cal. Rptr. 385, 387 (1966); People v. Sims, 64 Cal. App. 3d 544, 552, 134 Cal. Rptr. 566, 571 (1976). The *Ellis* court explained that in a voice identification test "the speaker is asked, not to communicate ideas or knowledge of facts, but to engage in the physiological processes necessary to produce a series of articulated sounds, the verbal meanings of which are unimportant." 65 Cal. 2d at 533-34, 421 P.2d at 394-95, 55 Cal. Rptr. at 386-87. According to the court, such a test is distinguishable from a demand for testimony of the suspect's own guilt, in that the identification test does not subject the

physical characteristics such as physique, or color of eyes or hair, which are held to be unquestionably outside fifth amendment protection.[96] In being compelled to speak for identification purposes, the accused is required to produce a series of sounds whose meaning is unimportant, not to communicate any knowledge he has, and is therefore not being compelled to give testimonial evidence.[97] Upon this reasoning, it has been held that since a defendant's voice is not within the privilege, his refusal to submit voice exemplars is circumstantial evidence of his consciousness of guilt,[98] which may become a proper subject for comment by the prosecution.[99]

The second legal issue involves the evidentiary rules for the admission of scientific evidence. Two interlocking questions are presented: First, whether, in view of the scientific debate over the technique and the margin of error still found in it, spectrographic voice identification is sufficiently reliable to be admitted as evidence in criminal trials; and second, what evidentiary standard should govern the admissibility of voiceprint testimony.[100]

A major concern in any issue involving scientific evidence is its tendency to mislead the jury.[101] Scientific experiments and conclusions

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accused to psychological pressure to confess, nor does it compel disclosure of thoughts or privately held information. *Id.* at 533-35, 421 P.2d at 394-96, 55 Cal. Rptr. at 386-88.

96. *See, e.g.*, United States v. Wade, 388 U.S. 218, 222-23 (1967) (defendant, in lineup, was asked to repeat words robber had used); Schmerber v. California, 384 U.S. 757, 764 (1966) (while defendant was in hospital and unconscious, blood sample was withdrawn to determine its alcohol content); Gilbert v. United States, 366 F.2d 923, 937 (9th Cir. 1966) (defendant, in lineup, required to repeat in loud and soft voice words robbers had used), *cert. denied*, 393 U.S. 985 (1968).

97. United States v. Dionisio, 410 U.S. 1, 7 (1973); United States v. Wade, 388 U.S. 218, 222-23 (1967); Gilbert v. United States, 366 F.2d 923, 937 (9th Cir. 1966), *cert. denied*, 393 U.S. 985 (1968); State v. Spain, 27 Ariz. App. 752, 756, 558 P.2d 947, 951 (1976); People v. Ellis, 65 Cal. 2d 529, 533-35, 421 P.2d 393, 394-96, 55 Cal. Rptr. 385, 386-88 (1966); Reed v. State, 35 Md. App. 472, 491-92, 372 A.2d 243, 256 (1977). The above cases carefully distinguish between eliciting a defendant's speech for purposes of voice identification and eliciting speech for the purpose of uncovering incriminating evidence. Professor Wigmore related the scope of the fifth amendment privilege to its purpose of preventing compelled communication of inculpatory information. "[T]he privilege is limited to testimonial disclosures. It was directed at the employment of legal process to extract from the person's own lips an admission of guilt, which would thus take the place of other evidence." 8 J. WIGMORE, EVIDENCE § 2263, at 378 (McNaughton rev. ed. 1961) (emphasis deleted).

98. *See* People v. Ellis, 65 Cal. 2d 529, 536-37, 421 P.2d 393, 397, 55 Cal. Rptr. 385, 389 (1966).

99. *Id.* at 536-38, 421 P.2d at 397-98, 55 Cal. Rptr. at 389-90. *Cf.* Campbell v. Superior Court, 106 Ariz. 542, 549, 479 P.2d 685, 692 (1971) (same reasoning applied to refusal to submit to intoxication test). One court has held, however, that if a defendant is given a Miranda warning in the form of an absolute right to remain silent, the prosecution may not comment upon this refusal unless he has been warned further that this right does not include the right to refuse to participate in a voice test. People v. Ellis, 65 Cal. 2d at 538-39, 421 P.2d at 398-99, 55 Cal. Rptr. at 390-91. Usually, a defendant cannot be expected to distinguish between a refusal to speak for communication, which bears no sanction, and a refusal to speak for voice identification, which gives rise to detrimental prosecutorial comment. *Id.*

100. *See, e.g.*, People v. Kelly, 17 Cal. 3d 24, 27-28, 549 P.2d 1240, 1242, 130 Cal. Rptr. 144, 146 (1976); State v. Williams, 388 A.2d 500, 501 (Me. 1978); Commonwealth v. Lykus, 367 Mass. 191, 195-96, 327 N.E.2d 671, 674 (1975).

101. United States v. Williams, 583 F.2d 1194, 1198-99 (2d Cir. 1978), *cert. denied*, 439 U.S.

often carry with them an air of certainty, even if the branch of science to which they belong is only in its preliminary stages of development.[102] Since a defendant's guilt must be proven beyond a reasonable doubt, the court should be particularly careful that a new scientific process comprising part of that proof be reliable.[103] In support of a strict standard of admissibility for spectrographic evidence, it has been argued that a jury of laymen is not qualified to evaluate the weaknesses of this new scientific technique or to make a determination as to its scientific validity.[104] Admitting this evidence before it has been verified by scientists may, by its misleading posture of accuracy, invade the jury's province of deciding the issue of guilt or innocence.[105]

On the other hand, it has been held that these dangers can be adequately guarded against should spectrographic evidence be admitted.[106] If the voice tapes and spectrograms themselves are submitted to the jury, the jury can make its own direct evaluation of the objective elements of spectrography.[107] The possibility of error in the method can be pointed out during examination, and the reliability of the method can be refuted during cross-examination.[108] Finally, the jury can be instructed that it may disregard the evidence of identification by voice spectrography if it considers the technique unreliable or its results misleading.[109]

1117 (1979); United States v. Addison, 498 F.2d 741, 744 (D.C. Cir. 1974); Huntingdon v. Crowley, 64 Cal. 2d 647, 656, 414 P.2d 382, 390, 51 Cal. Rptr. 254, 262 (1966). In United States v. Baller, 519 F.2d 463, 466-67 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975), the court held that the trial court had adequately guarded against the danger that the jury might be misled for the following reasons: (1) The state's witness had been properly qualified as an expert; (2) the probative value of the spectrographic evidence had been established on voir dire; (3) competent witnesses had been available to the defendant to refute the spectrographic testimony; (4) the possibilities of error in the spectrographic technique and in the particular test administered to the defendant were brought out in cross examination; (5) the tapes used in the identification were available to the jury for verification of the expert's conclusions or for the jury's own aural comparison; and (6) the jury was instructed that it could disregard the expert's conclusions or the spectrographic technique, or both, if it found them unreliable. *Id.* at 466-67.

102. See cases cited note 101 *supra*.

103. *See* People v. Kelly, 17 Cal. 3d 24, 32, 549 P.2d 1240, 1245, 130 Cal. Rptr. 144, 149 (1976); People v. Law, 40 Cal. App. 3d 69, 85, 114 Cal. Rptr. 708, 719 (1974).

104. Comment, *supra* note 4, at 526.

105. *Id.* at 526-27.

106. United States v. Williams, 583 F.2d 1194, 1199-1200 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); United States v. Baller, 519 F.2d 463, 466-67 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975).

107. United States v. Williams, 583 F.2d 1194, 1199 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); United States v. Baller, 519 F.2d 463, 466-67 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975).

108. United States v. Williams, 583 F.2d 1194, 1200 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); United States v. Baller, 519 F.2d 463, 466-67 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975).

109. United States v. Williams, 583 F.2d 1194, 1200 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); United States v. Baller, 519 F.2d 463, 467 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975).

The Evidentiary Standards

Three different evidentiary standards are employed by the courts to determine the admissibility of voiceprint testimony,[110] and it is around these three standards that the current controversy concerning admissibility revolves. In each of the separate standards, the court makes its analysis in a two-step process.[111] First, it must determine that the reliability of the scientific method has been established, and also that the witness furnishing testimony about the method is properly qualified as an expert to give an opinion on this subject. Second, the court must weigh the method's reliability against the evidentiary rule most appropriate for considering spectrographic evidence.[112] The various approaches to the admissibility question diverge at the point of choosing the most appropriate evidentiary standard.

The evidentiary standard now applied by most courts[113] was first set out in *Frye v. United States*.[114] While recognizing the importance of scientific testimony deduced from a recognized principle or discovery, the court nevertheless required that "the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs."[115] The "particular field" has generally been held to be composed of "recognized experts in the field"[116] or "a typical cross-section of the scientific community."[117] To determine whether the technique has gained the requisite general acceptance, the court must gather the opinions of several scientists through testimony, case law, comments, and reputable scientific articles.[118]

In view of the limited number of experts in audiology who are conversant with the science of spectrography,[119] some courts, while

110. *See, e.g.*, United States v. Addison, 498 F.2d 741, 742-43 (D.C. Cir. 1974); People v. Williams, 164 Cal. App. 2d 858, 862, 331 P.2d 251, 253 (1958); C. MCCORMICK, HANDBOOK ON THE LAW OF EVIDENCE 490 n.31 (2d ed. E. Cleary 1972).

111. *See* People v. Kelly, 17 Cal. 3d 24, 30, 549 P.2d 1240, 1244, 130 Cal. Rptr. 144, 148 (1976).

112. *See* United States v. Williams, 583 F.2d 1194, 1200 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); People v. Kelly, 17 Cal. 3d 24, 30, 549 P.2d 1240, 1244, 130 Cal. Rptr. 144, 148 (1976); People v. King, 266 Cal. App. 2d 437, 444-45, 72 Cal. Rptr. 478, 482-83 (1968); C. MCCORMICK, *supra* note 110, at 490 n.31; Comment, *supra* note 2, at 526.

113. *E.g.*, People v. Kelly, 17 Cal. 3d 24, 31, 549 P.2d 1240, 1244, 130 Cal. Rptr. 144, 148 (1976); People v. Law, 40 Cal. App. 3d 69, 74-75, 84, 114 Cal. Rptr. 708, 711, 718 (1974); Reed v. State, 283 Md. 374, 386-87, 391 A.2d 364, 370-71 (1978).

114. 293 F. 1013 (D.C. Cir. 1923).

115. *Id.* at 1014.

116. People v. King, 266 Cal. App. 2d 437, 443, 72 Cal. Rptr. 478, 482 (1968).

117. People v. Kelly, 17 Cal. 3d 24, 37, 549 P.2d 1240, 1248, 130 Cal. Rptr. 144, 152 (1976). Within this broad definition of the relevant scientific community would fall all scientists whose background and training enable them to comprehend the new technique and form a reasoned opinion as to its reliability. Reed v. State, 283 Md. 374, 382, 391 A.2d 364, 368 (1978).

118. People v. Law, 40 Cal. App. 3d 69, 75, 114 Cal. Rptr. 708, 711-12 (1974). *See* People v. Kelly, 17 Cal. 3d 24, 37, 130 Cal. Rptr. 144, 152, 549 P.2d 1240, 1248 (1976).

119. *See* Commonwealth v. Lykus, 367 Mass. 191, 204, 327 N.E.2d 671, 678 (1975). *Cf.* Hodo

purporting to follow the Frye standard, have modified that test.[120] As first applied in *People v. Williams*,[121] this standard is satisfied if the scientific technique is generally accepted by those scientists who would be expected to be familiar with its use.[122] Courts applying the Williams standard include in this group scientists who have directly participated in voiceprint experiments, particularly the Tosi experiment.[123] While acknowledging the dissention in the acoustical field regarding the accuracy of the technique, these courts have reasoned that "general acceptance" does not require unanimity among scientists.[124]

A third standard, applied in many recent decisions, differs altogether from the Frye standard. According to this standard, proposed by Professor McCormick, "[a]ny conclusions which are supported by a qualified witness should be received unless there are other reasons for exclusion."[125] The McCormick standard involves weighing the probativeness, materiality, and reliability of the scientific evidence against its tendency to mislead or prejudice the jury.[126] Evidence of scientific dispute regarding the reliability of the spectrographic technique should go to the weight of the voiceprint testimony, which is to be evaluated by the jury, but not to the issue of admissibility.[127]

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v. Superior Court, 30 Cal. App. 3d 778, 784, 106 Cal. Rptr. 547, 550 (1973) (using the language of the Frye test, but not citing that case).

120. *See* Commonwealth v. Lykus, 367 Mass. 191, 202-03, 327 N.E.2d 671, 677 (1975). *See also* Hodo v. Superior Court, 30 Cal. App. 3d 778, 788, 106 Cal. Rptr. 547, 553 (1973); People v. Williams, 164 Cal. App. 2d 858, 861-62, 331 P.2d 251, 253 (1958).

121. 164 Cal. App. 2d 858, 331 P.2d 251 (1958). Although sometimes applied to voice spectrography, this case concerned a Nalline blood test, administered to determine whether, and in what amount, a person has been using narcotic drugs. *Id.* at 859-60, 331 P.2d at 251-52.

122. *Id.* at 861-62, 331 P.2d at 253; Hodo v. Superior Court, 30 Cal. App. 3d 778, 788, 106 Cal. Rptr. 547, 553 (1973); Commonwealth v. Lykus, 367 Mass. 191, 203, 327 N.E.2d 671, 677 (1975).

123. Commonwealth v. Lykus, 367 Mass. 191, 204, 327 N.E.2d 671, 678 (1975). *See also* Black, *supra* note 90, at 536, where it is noted that Bolt and his associates, the main critics of spectrography, have not themselves conducted any spectrographic experiments.

124. Commonwealth v. Lykus, 367 Mass. 191, 204, 327 N.E.2d 671, 678 (1975). *See* People v. Williams, 164 Cal. App. 2d 858, 861-62, 331 P.2d 251, 253 (1958).

125. C. MCCORMICK, *supra* note 110, at 491. "Particularly, probative value may be overborne by the familiar dangers of prejudicing or misleading the jury, and undue consumption of time." *Id. See* United States v. Baller, 519 F.2d 463, 466, (4th Cir. 1975), *cert. denied*, 423 U.S. 1019 (1975); Reed v. State, 283 Md. 374, 418, 391 A.2d 364, 386-87 (1978) (Smith, J., dissenting).

126. United States v. Williams, 583 F.2d 1194, 1198 (2d Cir. 1978); *cert. denied*, 439 U.S. 1117 (1979); United States v. Baller, 519 F.2d 463, 466 (4th Cir. 1975), *cert. denied*, 423 U.S. 1019 (1975); State v. Williams, 388 A.2d 500, 503 (Me. 1978); C. MCCORMICK, *supra* note 110, at 485, 491. Most often the issue is narrowed to reliability only: If a proper foundation is laid and it is established that the unknown voice is related to the alleged crime, any evidence identifying the accused with that voice is obviously both probative and material. *See* United States v. Williams, 583 F.2d 1194, 1198 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979).

127. United States v. Williams, 583 F.2d 1194, 1198 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); United States v. Baller, 519 F.2d 463, 466 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975); State v. Williams, 388 A.2d 500, 505 (Me. 1978); Reed v. State, 283 Md. 374, 420-21, 391 A.2d 364, 387 (1978) (Smith, J., dissenting); C. MCCORMICK, *supra* note 110, at 491. It should be noted that *Williams* was based upon statutory interpretation rather than upon an analysis of case law. *See* State v. Williams, 388 A.2d at 503-05. The McCormick standard was codified in the Maine Rules of Evidence. ME. R. EVID. 401-403, 702 (1978). Under these rules, expert testimony may be admitted whenever it is relevant and can aid the trier of fact. *See* State v. Williams, 388 A.2d at 503.

In support of the Frye general acceptance test it has been argued that this standard promotes uniformity of decision regarding the admissibility of any given type of evidence.[128] The standard was formulated in order to prevent the hasty acceptance of scientific procedures still in their experimental stages, and as an assurance that the new methods gain such currency and status that the scientific community, their most knowledgeable and appropriate judge, consider them legitimate.[129] These precautions are considered necessary in order to guard against the danger of unfair prejudice at trial and to prevent the possible conviction of the innocent that could result from the admission of unreliable evidence.[130] Under this position, disagreement in the scientific community regarding the accuracy of voice spectrography requires the rejection of voiceprint evidence, because its acceptance by scientific opinion would not have been established.[131]

Like the Frye test, the Williams standard requires a general acceptance of a scientific technique among a certain scientific community.[132] By narrowing that community, however, the Williams standard is clearly a significant modification of Frye. Because of the high degree of specialization in scientific professions, the *Williams* court reasoned that one cannot expect that all scientists in a particular field would have the opportunity to study and evaluate any certain technique within the field.[133] For this reason, the court decided that acceptance among a smaller, more specialized group of scientists within the field is sufficient to admit testimony of the technique in question as reliable evidence.[134] Applied to voiceprint evidence, the Williams standard narrows the relevant scientific community from all of those in the acoustical sciences to only those familiar with the spectrographic technique.[135]

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128. People v. Kelly, 17 Cal. 3d 24, 31, 549 P.2d 1240, 1244-45, 130 Cal. Rptr. 144, 148-49 (1976).

129. United States v. Addison, 498 F.2d 741, 743-44 (D.C. Cir. 1974); People v. Kelly, 17 Cal. 3d 24, 31, 549 P.2d 1240, 1245, 130 Cal. Rptr. 144, 149 (1976). *See* Reed v. State, 283 Md. 374, 382-86, 391 A.2d 364, 368-72 (1978).

130. Comment, *supra* note 4, at 528. *See* People v. Law, 40 Cal. App. 3d 69, 85 n.16, 114 Cal. Rptr. 708, 719 n.16 (1974).

131. Reed v. State, 283 Md. 374, 397, 391 A.2d 364, 376 (1978). *See* Comment, *supra* note 4, at 510.

132. *See* Commonwealth v. Lykus, 367 Mass. 191, 203-04, 327 N.E.2d 671, 677-78 (1975); text & notes 115, 122 *supra*. *See also* Reed v. State, 283 Md. 374, 382, 391 A.2d 364, 368 (1978).

133. *See* People v. Williams, 164 Cal. App. 2d 858, 862, 331 P.2d 251, 253 (1958).

134. *See id.*

135. *See* Hodo v. Superior Court, 30 Cal. App. 3d 778, 789, 106 Cal. Rptr. 547, 553 (1973); Commonwealth v. Lykus, 367 Mass. 191, 203-04, 327 N.E.2d 671, 677-78 (1975); text & note 123 *supra*. *See also* People v. Williams, 164 Cal. App. 858, 862, 331 P.2d 251, 253 (1958). Some courts applying this standard have maintained that the Tosi experiment has so proven the technique's reliability that the weight of the scientific opposition is significantly diminished. *See* Hodo v. Superior Court, 30 Cal. App. 3d 778, 786, 789, 106 Cal. Rptr. 547, 551, 553 (1973). *But see* People v. Kelly, 17 Cal. 3d 24, 34-35, 549 P.2d 1240, 1247, 130 Cal. Rptr. 144, 151 (1976) (*Hodo*, which determined the admissibility of spectrographic evidence at a preliminary hearing, held inapplicable to the question of admissibility of this evidence at trial).

The McCormick standard, by moving the question of scientific acceptance out of the determination of admissibility, leaves the validity of an identification made by voiceprints to the jury's consideration.[136] Cross-examination that tests the qualifications of the expert, the reliability of his techniques, the equipment used, and the particular spectrograms submitted at the trial might allow the jury to evaluate the technique without being misled.[137] The jurors might be instructed that they must consider the examiner's procedure, qualifications, and conclusion, and that they may reject any of them.[138] They might also be instructed that they must determine the weight of the spectrographic testimony, and that they may reject the technique as unreliable or misleading.[139] Thus, while a judge might place more emphasis on evidence of general acceptance in cases involving new scientific techniques, the McCormick standard allows this issue to remain merely as a guard against prejudice or misleading the jury; it does not hold out such acceptance as an independently controlling standard of admissibility, as does the Frye standard.[140]

In providing that all relevant scientific evidence is admissible unless its probativeness is outweighed by a danger of misleading the jury, the Federal Rules of Evidence codify the McCormick standard.[141] As long as voiceprint evidence is "relevant" within the meaning of the Rules, it is admissible.[142] Under the McCormick standard, general ac-

136. *See* text & notes 125-27 *supra*.

137. United States v. Williams, 583 F.2d 1194, 1200 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979).

138. *See id.*

139. *Id.* The trial judge's instruction, which the appellate court thought excellent, read:

> The government has offered the testimony of Frederick Lundgren as an expert in voice identification, through the technique of spectrographic analysis. You will recall that he testified with respect to a comparison which he made between the voice on an exemplar made by Mr. Williams and a voice that appeared on the tape recording of a telephone conversation which Mr. Lopez testified he recorded. You may consider Mr. Lundgren's opinion on this matter. You may give that opinion whatever weight you feel it deserves, taking into account Mr. Lundgren's qualifications, his methods, and the reasons he gave for his opinion. But I want to stress again that you are the finders of fact in this case. It is you who must determine whether the known voice and the questioned voice are the same or different. You may listen to the tapes yourselves and reach a different conclusion than did Mr. Lundgren. You may conclude that his opinion is not based on adequate education, training, or experience. You may decide that the technique of spectrographic analysis is not reliable. You may conclude that however reliable the technique, Mr. Lundgren has not had sufficient education, training, or experience to be relied upon as a practitioner of that technique. Or you may decide that the technique is reliable and that Mr. Lundgren is a reliable practitioner of the technique, but that you disagree with his conclusion.

Id.

140. State v. Williams, 388 A.2d 500, 504 (Me. 1978). It has been said that "the courts cannot in any event surrender to scientists the responsibility for determining the reliability of [scientific] evidence." United States v. Williams, 583 F.2d 1194, 1198 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979).

141. *See* FED. R. EVID. 402, 403, 702.

142. *See id.* 401, 402, 403, 702; State v. Williams, 388 A.2d 500, 503 (Me. 1978) (general scien-

ceptance is only one indication of the probativeness of the evidence, to be weighed with all other factors affecting its relevancy.[143] Thus, under the McCormick standard and the Federal Rules, the only evidentiary question is whether spectrographic voice analysis is reliable enough to make the existence of a fact—such as the fact that the unknown voice and the defendant's voice are the same—more probable or less probable than it would be without voiceprint testimony.[144]

Choosing Standard Means Choosing Result

Given the scientific community's equivocal acceptance of voice spectrography, a court's selection among the three evidentiary standards determines whether such evidence is admitted at trial. For example, the scientific imbroglio surrounding voiceprints precludes any court applying the Frye general acceptance standard from admitting evidence concerning that process.[145] The decision of a court applying the McCormick standard, though opposite in result, is just as predictable. Spectrographic evidence must be admitted unless it is found to be so unreliable as to be irrelevant, or unless its relevancy is overborne by prejudicial or misleading qualities of the evidence.[146] To date, courts applying this standard have found voice spectrography to be sufficiently reliable to meet the relevancy criterion, and have not found it excessively prejudicial or misleading.[147] In contrast, courts applying the Williams standard are faced with a dichotomy between theory and result. The Williams standard is analytically nearly indistinguishable from the Frye standard.[148] Both standards require general acceptance of the technique among a certain group of scientists;[149] Williams merely narrows the relevant scientific constituency to a subgroup of

tific acceptance of spectrography might help determine its "relevance" under state rules of evidence patterned after Federal Rules).

143. State v. Williams, 388 A.2d 500, 504 (Me. 1978); Jones, *supra* note 12, at 314. *See* text & notes 139-40 *supra*.

144. *See* FED. R. EVID. 401. The same analysis, of course, is applicable to any state rules of evidence patterned after the federal rules.

145. *See, e.g.*, People v. Kelly, 17 Cal. 3d 24, 27-28, 549 P.2d 1240, 1242, 130 Cal. Rptr. 144, 146 (1976); Reed v. State, 283 Md. 374, 396-97, 391 A.2d 364, 375-76 (1978); People v. Tobey, 401 Mich. 141, 147, 257 N.W.2d 537, 540 (1977); Comment, *supra* note 4, at 510.

146. *See* United States v. Williams, 583 F.2d 1194, 1198 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); United States v. Baller, 519 F.2d 463, 466 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975); State v. Williams, 388 A.2d 500, 503-04 (Me. 1978); C. MCCORMICK, *supra* note 110, at 491.

147. *E.g.*, United States v. Williams, 583 F.2d 1194, 1198-99 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); United States v. Baller, 519 U.S. 463, 466-67 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975); State v. Williams, 388 A.2d 500, 505 (Me. 1978). *See* Reed v. State, 283 Md. 374, 451-52, 391 A.2d 364, 402-03 (1978) (Smith, J., dissenting).

148. *Compare* text & note 115 *supra with* text & note 154 *infra*.

149. *Compare* People v. Williams, 164 Cal. App. 2d 858, 862, 331 P.2d 251, 253 (1958) *and* Commonwealth v. Lykus, 367 Mass. 191, 203, 327 N.E.2d 671, 677 (1975) *with* Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923) *and* People v. Kelly, 17 Cal. 3d 24, 30, 549 P.2d 1240, 1244, 130 Cal. Rptr. 144, 148 (1976).

spectrographic scientists, within the larger field of acoustical scientists encompassed by the Frye standard.[150] Nevertheless, this slight analytical difference has led courts applying the Williams standard to admit evidence of spectrophic voice identification.[151] Narrowing the relevant scientific community means that debate among scientists not familiar with the technique does not affect the evidentiary question.[152] By tolerating more controversy, the Williams standard relaxes the requirement for admissibility.[153] Hence the dichotomy: These courts employ an analysis akin to the Frye standard, but arrive at a result akin to one under the McCormick standard.[154]

Courts requiring spectrographic evidence to satisfy the stringent Frye standard appear to have done so on the strength of an analogy to polygraph evidence.[155] The ultimate process in spectrography, as in a polygraph test, is subjective.[156] The examiner must determine not only what constitutes a similarity between spectrograms, but also whether the similarities he notes support the conclusion that the two voices are the same.[157] The final evaluation is made by a person.[158] Nevertheless, this resemblance between the two procedures cannot obscure the difference in the breadth of inference that is drawn from the test results of each.[159] In voice spectrography, the examiner does no more than compare the graphic representations of certain aspects of the voice in order to support a conclusion about a physical characteristic, the voice.[160] In contrast, the polygraph examiner must extrapolate from the machine's measurement of physical characteristics to arrive at a conclusion about a factor those measurements do not directly reflect, the credibility of the person examined.[161] Most importantly, the strong relation of poly-

150. *See generally* text & notes 120-24, 135 *supra*.

151. *See* Hodo v. Superior Court, 30 Cal. App. 3d 778, 788-89, 106 Cal. Rptr. 547, 553 (1973); Commonwealth v. Lykus, 367 Mass. 191, 202-04, 327 N.E.2d 671, 677-78 (1975). *Cf.* People v. Williams, 164 Cal. App. 2d 858, 862, 331 P.2d 251, 253 (1958) (formulating standard regarding admissibility of Nalline test to determine drug use).

152. *See generally* People v. Williams, 164 Cal. App. 2d 858, 862, 331 P.2d 251, 253 (1958); Commonwealth v. Lykus, 367 Mass. 191, 203, 327 N.E.2d 671, 677 (1975).

153. *Compare* People v. Williams, 164 Cal. App. 2d. 858, 862, 331 P.2d 251, 253 (1958) *and* Commonwealth v. Lykus, 367 Mass. 191, 204, 327 N.E.2d 671, 678 (1975) *with* People v. Kelly, 17 Cal. 3d 24, 31-32, 37, 549 P.2d 1240, 1244-45, 1248, 130 Cal. Rptr. 144, 148-49, 152 (1976) *and* People v. Tobey, 401 Mich. 141, 147, 257 N.W.2d 537, 540 (1977).

154. *See* Hodo v. Superior Court, 30 Cal. App. 3d 778, 788-89, 106 Cal. Rptr. 547, 553 (1973); Commonwealth v. Lykus, 367 Mass. 191, 202-04, 327 N.E.2d 671, 677-78 (1975).

155. *See* Commonwealth v. Lykus, 367 Mass. 191, 197, 327 N.E.2d 671, 674-75 (1975).

156. *Id.*; Bolt, *supra* note 5, at 600.

157. *See* Bolt, *supra* note 5, at 600.

158. *Id.*

159. United States v. Williams, 583 F.2d 1194, 1199 n.9 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); Reed v. State, 283 Md. 374, 414, 391 A.2d 364, 384 (1978) (Smith, J., dissenting); Commonwealth v. Lykus, 367 Mass. 191, 197, 327 N.E.2d 671, 674-75 (1975).

160. United States v. Williams, 583 F.2d 1194, 1199 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); Commonwealth v. Lykus, 367 Mass. 191, 197, 327 N.E.2d 671, 674-75 (1975).

161. *See* United States v. Williams, 583 F.2d 1194, 1199 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); Commonwealth v. Lykus, 367 Mass. 191, 197, 327 N.E.2d 671, 674-75 (1975).

graph evidence to the issue of guilt or innocence justifies its harsh scrutiny under Frye. In purporting to record whether a defendant is lying when he denies involvement in a crime, the polygraph directly implies his guilt or innocence. Such evidence would usurp the duty the Constitution confers upon the jury, and so its reliability should be carefully questioned before it is admitted.[162] It is clear that this rationale has no relevancy to spectrographic evidence, since voice spectrography in no way touches on the issue of the truth of the defendant's assertions.[163] Finally, the purpose of polygraphic examination is to detect the accused's consciousness of guilt. Insofar as the polygraph is directed toward eliciting responses based upon the accused's conscious knowledge, his answers in polygraph testing may be considered testimonial.[164] In contrast, the purpose of spectrographic analysis is only to obtain physical evidence. It measures readily observable characteristics of the voice that are constantly exposed to the public, and does not purport to probe into private thoughts.[165]

McCormick Standard Is the Best Choice

The McCormick standard is the most appropriate standard for the admissibility of spectrographic voice identification evidence. As long as the accuracy of that scientific process can be proven and attacked through expert testimony at trial, it is unreasonable to impose on its admissibility the Frye and Williams prerequisite of general scientific acceptance.[166] If the issue were whether judicial notice should be taken of the technique, such that the jury would be required to accept an identification made through voice spectrography as an incontrovertible fact, then perhaps general acceptance should be required.[167] The issue, however, is admissibility alone, not the truth of any scientific fact,[168] nor even the absolute certainty of the identification.[169] No distinction should be made, therefore, between spectrographic evidence and other

162. Reed v. State, 283 Md. 374, 447, 391 A.2d 364, 401 (1978) (Smith, J. dissenting); Commonwealth v. Lykus, 367 Mass. 191, 197, 327 N.E.2d 671, 674-75 (1975).

163. *See* Reed v. State, 283 Md. 374, 447, 391 A.2d 364, 401 (1978) (Smith, J., dissenting); Commonwealth v. Lykus, 367 Mass. 191, 197, 327 N.E.2d 671, 674-75 (1975).

164. People v. Ellis, 65 Cal. 2d 529, 537 & n.9, 421 P.2d 393, 397 & n.9, 55 Cal. Rptr. 385, 389 & n.9 (1966).

165. *See* United States v. Dionisio, 410 U.S. 1, 14 (1973) (using this reasoning regarding voice exemplars for identification, although those exemplars did not involve spectrographic analysis); People v. Ellis, 65 Cal. 2d 529, 535-37 & n.9, 421 P.2d 393, 396-97 & n.9, 55 Cal. Rptr. 385, 388-89 & n.9 (1966) (same).

166. *See* C. MCCORMICK, *supra* note 110, at 433. "[I]n the search for the truth of the issue, reason would suggest that if evidence is logically probative, it should be received unless there is some distinct ground for refusing to hear it." *Id. See also* State v. Williams, 388 A.2d 500, 503 (Me. 1978).

167. *See* C. MCCORMICK, *supra* note 110, at 491.

168. United States v. Williams, 583 F.2d 1194, 1198 (2d Cir. 1978), cert. denied, 439 U.S. 1117 (1979); State v. Williams, 388 A.2d 500, 503 (Me. 1978).

169. *See* text & notes 136-39 *supra.*

types of expert testimony, which are regularly admitted as long as the expert is properly qualified and his testimony will assist the trier of fact.[170] Spectrographic evidence should be excluded only if the trial judge determines that popular opinion has exaggerated the accuracy of the technique, making a voiceprint identification prejudicial or misleading.[171]

Besides the safeguards of cross-examination and jury instruction, the McCormick test has an inherent safeguard of its own preventing any unmerited reliance by the jury on the accuracy of spectrography.[172] If counsel seriously questions the reliability of the identification, a preliminary hearing may be held to decide the admissibility of the identification evidence.[173] If the attack establishes a fundamental inaccuracy in the spectrographic method or in its particular application to the case *sub judice*, so that the evidence would be of no assistance to the trier of fact, it may be proper to exclude that evidence on the ground that it has too great a tendency to mislead.[174] If, on the other hand, the attack reveals only that reasonable minds can differ on the reliability of the technique, and that evidence of a spectrographic identification will aid the jury despite this uncertainty, the evidence should be admitted.[175]

Several aspects of spectrographic identification show that the method is suitable for jury consideration. First, standards are maintained for the training and certification of spectrograph examiners and the number of similarities required in matching spectrograms.[176] In addition, spectrography's mechanical process is fail-safe, because it gives the criminal defendant the benefit of any doubt in the analysis. Any irregularity in the voice exemplars, such as a poor quality of the tapes of the "unknown" voice, the deterioration of the tapes over time, poor recording conditions, or changes in the speaker's mental or physical state would most likely produce differences between the "unknown" spectrograms and a voiceprint later taken of the defendant.[177] Therefore, any failure of the method to record accurately the characteristics

170. *See* State v. Williams, 388 A.2d 500, 503-04 (Me. 1978); Reed v. State, 283 Md. 374, 418-22, 436-37, 391 A.2d 364, 386-88, 395-96 (1978) (Smith, J., dissenting).

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

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

173. *Id.*

174. *Id.*

175. *See id. Cf.* United States v. Baller, 519 F.2d 463, 465 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975) (admissibility turns on whether spectrographic voice identification has been proven reliable enough to allow a jury to consider it).

176. *See* United States v. Williams, 583 F.2d 1194, 1198 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); Black, *supra* note 90, at 536; Jones, *supra* note 14, at 304; Kamine, *supra* note 15, at 216.

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

of the defendant's voice would lead toward a conclusion that the two voices analyzed are different, or that no determination regarding identification is possible.[178]

Such a result gives the defendant the benefit of any doubt in the identification process.[179] Finally, in its method of comparing exemplars to evaluate points of similarity and dissimilarity between them, spectrography is analogous to many other types of scientific evidence, such as handwriting analysis and comparison of ballistics striations, routinely admitted for the jury's consideration.[180]

The Federal Rules of Evidence are also subject to these safeguards, in their incorporation of the McCormick standard. As issues of the admissibility of scientific evidence have arisen under the Federal Rules and parallel state enactments, use of the McCormick standard has encouraged the admission of this evidence in the latter part of the decade.[181] As a result, some commentators have described a trend in the voiceprint cases towards admissibility of spectrographic evidence.[182] Although it is true that some recent decisions admit spectrographic evidence, either under the McCormick standard,[183] or under

178. *Id. See* Black, *supra* note 90, at 536 (examiner's caution in reaching conclusions, and expressing no opinion when his conclusions are doubtful, increases the reliability of the positive identifications he does make).

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

180. *See, e.g., id.*; Reed v. State, 283 Md. 374, 418-47, 391 A.2d 364, 386-401 (1978) (Smith, J., dissenting); Decker & Handler, *supra* note 2, at 360-61; Kamine, *supra* note 15, at 215.

Although there is currently no case law in Arizona respecting spectrographic voice identification, Arizona courts have often held that the reliability or general acceptance of a scientific technique goes to its weight and not its admissibility, and have retained the Frye standard only for polygraph evidence. *Compare* State v. Kelly, 111 Ariz. 181, 188, 526 P.2d 720, 727 (1975) (footprints); State v. Thomas, 78 Ariz. 52, 64, 275 P.2d 408, 416 (1954) (blood grouping tests); State v. Olivas, 77 Ariz. 118, 119, 267 P.2d 893, 894 (1954) (breathalyzer test); *and* Moon v. State, 22 Ariz. 418, 423, 198 P. 288, 290 (1921) (fingerprints) *with* State v. Valdez, 91 Ariz. 274, 277, 371 P.2d 894, 896 (1962) (polygraph). In addition, the Arizona Rules of Evidence, patterned closely after the Federal Rules, mandate this approach. *See* ARIZ. R. EVID. 401, 402, 403, 702; text & notes 141-44 *supra*. Polygraph evidence remains a particular exception to Arizona's general rule because of its effect upon the ultimate issue of guilt or innocence. *See* State v. Valdez, 91 Ariz. 274, 277, 371 P.2d 894, 896 (1962); C. MCCORMICK, *supra* note 110, at 491; Comment: *Admissibility of the Results of a Lie-Detector Test*, 5 ARIZ. L. REV. 76, 78 (1963-64); text & notes 155-65 *supra*.

181. *See generally* United States v. Williams, 583 F.2d 1194, 1200 n.11 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); State v. Williams, 388 A.2d 500, 503, 505 (Me. 1978); Decker & Handler, *supra* note 2, at 350, 354. *Compare* United States v. Amaral, 488 F.2d 1148, 1152 (9th Cir. 1973) (pre-Federal Rules, imposing additional general acceptance requirement) *with* United States v. Williams, 583 F.2d 1194, 1198 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979) (Federal Rules, applying McCormick standard). It is interesting to note that recent decisions imposing the Frye standard have come from states whose evidence codes do not parallel the Federal Rules. *See generally* People v. Kelly, 17 Cal. 3d 24, 30-31, 549 P.2d 1240, 1244, 130 Cal. Rptr. 144, 148 (1976); Reed v. State, 283 Md. 374, 386-91, 499-502, 391 A.2d 364, 370-72, 426-27 (1978). As to why polygraph evidence remains subject to the Frye standard even in states applying the McCormick standard to other types of scientific evidence, see text & notes 155-65 *supra*.

182. *See, e.g.*, Decker & Handler, *supra* note 2, at 350, 354; Comment, *supra* note 2, at 187; Note, *supra* note 2, at 419, 430-31.

183. *See, e.g.*, United States v. Williams, 583 F.2d 1194, 1200 (2d Cir. 1978), *cert. denied*, 439 U.S. 1117 (1979); United States v. Baller, 519 F.2d 463, 464 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975); State v. Williams, 388 A.2d 500, 505 (Me. 1978).

the theoretically ambivalent Williams rule,[184] not all courts have so agreed.[185] Following the conservative requirements of the Frye standard, recent decisions from the highest court of several states have rejected that evidence.[186] Although these courts leave open the possibility that future experimentation and development of the technique may allow it to satisfy the Frye test and thus to become admissible, they assert that the technique is not yet ripe for use at trial.[187] Only in the federal system, where adoption of the McCormick standard has been mandated by the adoption of the Federal Rules of Evidence, might a consistent trend toward admissibility be firmly expected.[188]

CONCLUSION

Spectrographic voice identification involves a precise mechanical and electronic process of graphing certain characteristics of the human voice, as well as a careful scientific interpretation of those graphs. Scientific opinion remains divided on whether the spectrograph machine accurately records the vocal characteristics relevant to distinguishing one voice from another and whether the entire analytical procedure is reliable enough to produce an accurate identification.

Courts have taken three main approaches to the problem of the admissibility of spectrographic voice identification in criminal trials. Courts adhering to the Frye standard refuse to admit spectrographic evidence, because it has failed to gain general acceptance in the scientific field to which it belongs. In utilizing the Williams standard, courts have usually admitted spectrographic evidence on the ground that it has achieved general acceptance among the scientists in the appropriate field who are familiar with the use of the technique. Finally, many courts apply the comparatively lax admissibility standard explained by Professor McCormick and enacted in the Federal Rules of Evidence, that any evidence is admissible unless its relevance is outweighed by its prejudicial effect or by its tendency to mislead the jury.

Of these three standards, the McCormick standard is the most appropriate for determining the admissibility of spectrographic voice analysis. This is the standard applied to most other types of scientific evidence, and allows the admission of relevant expert testimony with-

184. *See* Commonwealth v. Lykus, 367 Mass. 191, 204-05, 327 N.E.2d 671, 678-79 (1975).
185. *See* text & notes 166-81 *supra*.
186. *See, e.g.*, People v. Kelly, 17 Cal. 3d 24, 28, 30-31, 549 P.2d 1240, 1242, 1244, 130 Cal. Rptr. 144, 146, 148 (1976); Reed v. State, 283 Md. 374, 377, 381-86, 391 A.2d 364, 365-66, 368-72 (1978); People v. Tobey, 401 Mich. 141, 147, 257 N.W.2d 537, 540 (1977).
187. *See, e.g.*, People v. Kelly, 17 Cal. 3d 24, 28, 41, 549 P.2d 1240, 1242, 1250, 130 Cal. Rptr. 144, 146, 148 (1976); Reed v. State, 283 Md. 374, 399-400, 391 A.2d 364, 377 (1978); People v. Tobey, 401 Mich. 141, 147, 257 N.W.2d 537, 540 (1977).
188. *See* text & notes 141-44 *supra*.

out undue restriction. By allowing full cross-examination of the spectrograph experts and instructing the jury that it may reject the technique or the experts' conclusions if it finds them unreliable, the court may guard against the danger that the jury may be misled by the air of certainty that often accompanies scientific evidence.