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VOICE IDENTIFICATION BASED ON SPECTROGRAPHIC ANALYSIS

This comment deals with spectrographic analysis and the conflict between courts' criteria for admissibility, using either the general-acceptance-of-the-scientific-community test or the accuracy-and-reliability test. The conclusion drawn is that the general-acceptance test should be coupled with judicial notice to avert the undesirable situation of having a lay jury making technical scientific judgments.

Spectrographic analysis¹ is the process of making a visual representation of sound. A 1972 study² of this process has suggested that a trained examiner could achieve a high degree of accuracy in identifying an unknown voice from among a number of known voices by visual inspection of the two-dimensional representation of speech samples.³

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1. State v. Cary, 99 N.J. Super. 323, 326, 239 A.2d 680, 683 (1968):

There are two basic types of voiceprints: (a) "bar" and (b) "contour". Both types may be the result of a person uttering a cue word or other words as taped. The "bar" voiceprint shows the resonance bars of the person's voice. The pattern of the bars determines what word is being said. In addition thereto, the voiceprint has dimensions of *time* (plotted from left to right, *i.e.*, the beginning of the word is at the left and the end is at the right); the *frequency* is plotted along the vertical axis (the lower pitch of sound appears at the bottom and higher pitch toward the top); and the *loudness* is ascertained by examining the blackness of the printing (the darker lines of the bar represent greater intensity of sound at each frequency for a particular time).

Kersta, *Voiceprint Identification*, 196 NATURE 1253, 1254 (1962), [hereinafter cited as Kersta];

The contour spectrogram (voiceprint) . . . has the same time and frequency dimensions as the bar spectrogram. The amplitude, however, is shown by seven quantized or contour steps. The term "contour" seemed applicable because the amplitude contours on this type voiceprint are like contour portrayals, amplitude doubles with each inward progression from one contour to the next, and we arrive at amplitude peaks as one arrives at altitude peaks on a topographical map.

2. Tosi, Oyer, Lashbrook, Pedrey, Nichol, & Nash, *Experiment on Voice Identification*, 51 J. ACOUST. SOC. AMER. 2030 (1972) [hereinafter cited as Tosi]; *Voice Identification Research, A Report to the Law Enforcement Assistance Administration, United States Department of Justice, Department of Michigan State Police, East Lansing, Michigan*, Grant No. N I 70-004, February 1971, p.2.
3. Tosi at 2041:

These findings suggest that if a trained nonprofessional examiner, using *only visual inspection of spectrograms* for purposes of identification and excluding any kind of listening, *is forced to reach a positive decision* in each case (devoting approximately 15 minutes to complete the task), his (her) expected errors of false elimination would be approximately 13%.

Further, considering the ratings of the scale of self-confidence used in this project, it could be concluded that if the experimental examiners had not been forced to produce a positive decision when uncertain, they would have reached a positive conclusion on only 74% of the total number of experimental trials in-

In the few cases which have thus far passed on the admissibility in evidence of voice identifications based on the principle of spectrographic analysis, the courts have reached their decisions through an application of either of the two tests: (1) whether the principle has gained the acceptance of the general scientific community, (2) whether the court has found that the process has sufficient accuracy and reliability. Acceptance of voice identifications based on spectrographic analysis in *United States v. Wright*⁴ in 1967 was predicated upon the "accuracy and reliability" test, while *People v. King*⁵ and *State v. Cary*,⁶ which followed *Wright* in close succession in 1968 but denied admissibility, were based on the "general scientific acceptance" test. The most recent cases, *State ex rel. Trimble v. Hedman*⁷ (1971) and *United States v. Raymond*⁸ (1972), have followed *Wright* in employing the "accuracy and reliability" test. The purpose of this comment is to delineate the courts' use of these tests and to substantiate the conclusion that use of the "general scientific acceptance" test can eliminate the necessity of having courts and juries make scientific judgments—a problem which exists when the "accuracy and reliability" test is employed.

THE ORIGIN AND THEORY OF SPECTROGRAPHIC ANALYSIS

Speech spectrography was first developed at Bell Telephone Laboratories in 1941⁹ and was used for military purposes during World War II.¹⁰ It was not developed further until 1962 when L. G. Kersta¹¹ conducted a study,¹² the results of which indicated an approximate error rate of one percent in voice identification based on spectrogram examinations.¹³

cluded in the forensic models, with approximately a 2% error of false identifications and approximately a 5% error of false eliminations.

It could be hypothesized that, if, in addition to visual comparisons of spectrograms, the examiners had been allowed to listen to the unknown and known voices, these errors might have been further reduced. (emphasis added)

4. 17 U.S.C.M.A. 183, 37 C.M.R. 447 (1967).
5. 266 Cal. App. 2d 437, 72 Cal. Rptr. 478 (1968).
6. 99 N.J. Super. 323, 239 A.2d 680 (1968), *aff'd*. 56 N.J. 16, 264 A.2d 209 (1970).
7. 291 Minn. 442, 192 N.W.2d 432 (1971).
8. 337 F. Supp. 641 (D.D.C. 1972).
9. Koenig, Dunn, & Lacy, *The Sound Spectrograph*, 18 J. ACOUST. SOC. AMER. 19 (1946). See also R. POTTER, G. KOPP & H. GREEN, *VISIBLE SPEECH* (1966).
10. Tosi, *supra* note 2. See also C. GRAY & G. KOPP, *VOICEPRINT IDENTIFICATION*, report presented to the Bell Telephone Lab., Inc. (1944).
11. L. G. Kersta is the founder and President of Voiceprint Laboratories, Inc., Somerville, New Jersey.
12. See Kersta, *supra* note 1.
13. Tosi, *supra* note 2; Kersta, *supra* note 1.

The validity of spectrographic analysis of the human voice is based on the theory that each person's manner of speaking is unique because of variations in (1) the size of and the manner in which the throat, nasal, and oral cavities are coupled and (2) the manner in which the lips, tongue, and other articulators are manipulated.¹⁴

The process of converting speech to its visual representation is accomplished by a spectrograph. The recording of an unknown voice is analyzed by an electronic filter and graphed on paper by an electronic stylus which is activated by the energy produced by the voice. The result is a spectrogram¹⁵ showing the relation of the voice's amplitude, frequency, and time. An examiner visually compares this to other spectrograms of known voices in an attempt to identify the unknown voice.¹⁶

COURT DECISIONS ON ADMISSIBILITY

A. EARLY CASES

The first appellate decision in this area was *State v. Cary*¹⁷ which remanded the case to determine whether the technique was accurate. A few months later, the court in *United States v. Wright*¹⁸ affirmed the trial court's admission of L. G. Kersta's¹⁹ testimony that he found twenty-three points of identity between the spectrograms of the defendant and an unknown person whose telephone call had been recorded.²⁰ Although noting that there had been evidence of disagreement in the scientific community as to the validity of this process, the court felt that Kersta's testimony²¹ established that the

14. Bolt, Cooper, David, Denes, Pickett, & Stevens, *Speaker Identification by Speech Spectrograms: A Scientists' View of its Reliability for Legal Purposes*, 47 J. Acoust. Soc. AMER. 597 (1970) [hereinafter cited as Bolt]. See also note 1 *supra*.

15. "Voiceprint" is the popular term for "spectrogram". It was first used in 1944 by Gray and Kopp, *supra* note 10, and was copyrighted by Voiceprint Laboratories, Inc., *supra* note 11.

16. Presti, *High-Speed Sound Spectrograph*, 40 J. ACOUST. SOC. AMER. 628 (1966) [hereinafter cited as Presti]; Bolt, *supra* note 14; Kersta, *supra* note 1.

17. 49 N.J. 343, 230 A.2d 384 (1967); the first lower court decision in which the principle was accepted was apparently *People v. Straehle* (Westchester County, N.Y.) in N.Y. Times, Apr. 12, 1966, at 1, col. 2. The indictment was dismissed when the jury failed to reach a verdict.

18. 17 U.S.C.M.A. 183, 37 C.M.R. 447 (1967).

19. See note 11 *supra*.

20. Kersta required a minimum of 16 points of identity as a basis for voice identification. See *United States v. Wright*, 17 U.S.C.M.A. 183, 37 C.M.R. 447 (1967).

21. 17 U.S.C.M.A. at 188-89, 37 C.M.R. at 451-52:

Starting in 1961, Kersta began to use the spectrograph to experiment with voice identification of humans. In a two-year experiment, one hundred and twenty-three persons were selected from the same "dialectical area" to eliminate obvious voice identification factors. With a group of twelve high school students trained by Mr. Kersta acting as voiceprint interpreters, a single word from voice

process demonstrated a "high degree of accuracy"²² and that the jury, having heard both recordings, could determine the margin of error in Kersta's testimony which the court analogized to that of a psychiatrist or handwriting analyst. The court said:

Courts have consistently recognized the admissibility of the testimony of experts in areas where there is neither infallibility of result nor unanimity of opinion as to the existence *vel non* of a particular condition or fact. For example, the difference of opinion among psychiatrists as to the mental condition of a particular person is very well known. See *United States v. Henderson*, 11 U.S.C.M.A. 556, 29 C.M.R. 372; *United States v. Carey*, 11 U.S.C.M.A. 443, 449, 29 C.M.R. 259. Identifying the author of a questioned document by comparison of the handwriting of the document with other handwritings made by known persons is commonplace in the courts, but it certainly cannot be said that all experts in the field and all techniques of identification are infallible. *United States v. DeLeo*, 5 U.S.C.M.A. 148, 153, 17 C.M.R. 148.²³

The dissenting judge argued that the court's decision should be based on how the process has been accepted by the scientific community:

Under the theme of the principal opinion, the results of a lie detector test would appear to be clearly admissible. A trained polygraph operator can undoubtedly qualify as an expert in his field. The polygraph machine itself has also "experimentally and in practical application, demonstrated a high degree of accuracy." See Inbau and Reid, *Lie Detection and Criminal Interrogation*, 3d ed. Nevertheless, it has been unanimously rejected by the courts as evidence, on the basis that it has not been shown to be generally accepted as reliable in the scientific community. It is by that standard that the product of such devices as the voiceprint machine is to be measured in considering its admissibility and not by the self-evident fact that

samples of the one hundred and twenty-three subjects was compared to voiceprints in a file of 14,000 prints obtained from the voices of employees at the Laboratory. The students achieved 96.5 percent success in identifying the speaker. Using a five-word sample, the students achieved 99.95 percent success. The results of this experiment were presented to the Acoustical Society of America and were published in a respected British scientific journal.

In March 1966, Mr. Kersta retired from Bell Laboratories and established his own firm to continue his work on voice identification and other sounds. Before this case, he had prepared between four hundred and five hundred voiceprints for use in "40 different cases" of law enforcement, and in various medical and psychiatric applications, ranging from voice analysis to determine disease in the vocal tract to the study of speech sounds as reflective of emotional stress. In the specific area of voice identification, he had obtained verification in "practically all of the cases" and, to his knowledge, had "made no mistakes".

Kersta's company later admitted to one mistaken identification. See note 42, *infra*.

22. 17 U.S.C.M.A. at 189, 37 C.M.R. at 452.

23. *Id.*

one of its inventors is an expert in its use and the interpretation of the results. This is the standard which the principal opinion ignores, but which is the necessary predicate for decision in this case.²⁴

He later quoted from *Frye v. United States*,²⁵ a case which had denied admissibility to the results of a systolic blood pressure deception test:

Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, 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.²⁶

He also noted that in *State v. Cary*,²⁷ the New Jersey Supreme Court, in remanding the case for further inquiry into the reliability of spectrographic analysis felt:

[T]hat something more than the bare opinion of one man, however qualified, is required. Certainly the prosecutor must satisfy the trial judge that identification by voiceprint technique and equipment has a sufficient scientific basis to produce uniform and reasonably reliable results. . .²⁸

The dissenting judge also felt that one aspect of the majority's holding had precluded effective impeachment of Kersta's testimony.²⁹

24. *United States v. Wright*, 17 U.S.C.M.A. 183, 190, 37 C.M.R. 447, 453 (1967) (dissenting opinion).

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

26. *United States v. Wright*, 17 U.S.C.M.A. 183, 193, 37 C.M.R. 447, 455 (1967) (dissenting opinion) quoting *United States v. Frye*, 293 F. 1013 (D.C. Cir. 1923).

27. *State v. Cary* was an appeal from a pre-trial order compelling the defendant to submit to a voice recording. The New Jersey Supreme Court in 49 N.J. 343, 230 A.2d 384 (1967), remanded the case for a determination of whether the technique was sufficiently accurate, noting that more than the opinion of one man would be required. On remand, 99 N.J. Super. 323, 239 A.2d 680 (1968), the court decided against admissibility. In 53 N.J. 256, 250 A.2d 15 (1969), the case again was remanded at the state's request to take further expert testimony. When the state failed to take additional testimony within the prescribed time, the New Jersey Supreme Court in 56 N.J. 16, 264 A.2d 209 (1970), affirmed the decision in 99 N.J. Super. 323, 239 A.2d 680 (1968), for the reasons stated in that opinion.

28. *United States v. Wright*, 17 U.S.C.M.A. 183, 193-94, 37 C.M.R. 447, 455 (1967) (dissenting opinion), quoting *State v. Cary*, 49 N.J. 343, 230 A.2d 384 (1967).

29. 17 U.S.C.M.A. at 195, 37 C.M.R. at 456. The majority decided that the trial court's refusal to allow one of the two defense witnesses to testify regarding the published results of a study to show that it was part of the basis for his opinion was not prejudicial

In *People v. King*,³⁰ which reversed a decision which allowed identification based on spectrogram examination, the court recalled past judicial error in the acceptance of identification methods.³¹ Kersta testified that his method had the same accuracy as fingerprint identification but agreed with the seven defense witnesses that it had not achieved general scientific acceptance. Other defense witness criticisms included Kersta's failure to reveal fully his technique³² and its inferiority to aural identification of voices.³³

The court's decision, like the dissent in *Wright*, was based on its finding that there had not been general acceptance of the process in the scientific community,³⁴ citing *Frye* as authority for this requirement. The court dealt extensively with the issue of whether or not Kersta was a qualified expert³⁵ and concluded that it "must not be overwhelmed by self-proclaimed experts"³⁶ nor should it receive "self-serving opinions"³⁷ before a process has received general scientific acceptance.

*State v. Cary*³⁸ overturned a pre-trial order compelling the defendant

error. The dissent argued that the jury was "allowed to know nothing of the extensive research and published studies which underpinned Clark's opinion. . . . Yet, Kersta was permitted to testify at will concerning the accuracy of his method, the scientific praise it had received, and the fact that he had heard no criticism. . . ."

30. 266 Cal. App. 2d 437, 72 Cal. Rptr. 478 (1968).

31. *Id.* at 445-46, 72 Cal. Rptr. at 483-84:

A Classic case of the erroneous acceptance of identification methods was the so-called Bertillon (French) system of identification which was used extensively in the 19th and early 20th centuries. Originally devised by Leonardo daVinci, the so-called Bertillon, or anthropometric method, is no longer used by the courts because of large margins of error which resulted in many errors of identification. We must be careful that the use of "voice-prints" does not repeat the tragic lessons of the Bertillon system.

See A. BERTILLON, METHOD FOR IDENTIFICATION OF CRIMINALS, INSTRUCTIONS FOR TAKING MEASUREMENTS AND DESCRIPTIONS (G. Muller transl. 1887).

32. See also Stevens, Williams, Carbonell, & Woods, *Speaker Authentication and Identification: A Comparison of Spectrographic and Auditory Presentations of Speech Material*, 44 J. ACOUST. SOC. AMER. 1596 (1968) [hereinafter cited as Stevens]; P. LADEFOGED & R. VANDERSLICE, THE VOICEPRINT MYSTIQUE, WORKING PAPERS IN PHONETICS 7 (1967) [hereinafter cited as LADEFOGED].

33. See also Stevens, *supra* note 32.

34. *People v. King*, 266 Cal. App. 2d 437, 458, 72 Cal. Rptr. 478, 491 (1968):

The present lack of reliability of the "voiceprint" process was best stated by the Speech Communications Committee of the Acoustical Society of America. The Committee unanimously passed a resolution rejecting Kersta's claim of reliability for his "voiceprint" process; the resolution stated that the sound spectrogram does not contain sufficient information to identify individual speakers.

35. *Id.* at 456, 72 Cal. Rptr. at 490:

A person may be an expert in a field or scientific discipline but not concerned with certain problems or familiar with certain areas within the field. Communication by speech does not fall within any one established category of science. Its understanding requires a knowledge of anatomy, physiology, physics, psychology and linguistics. It requires a knowledge of points of view and methods of investigation of several disciplines. Absent other methods of verification, or general acceptance by the scientific community or independent experts, a court could only receive Kersta's opinion on faith.

36. *Id.* at 457, 72 Cal. Rptr. at 491.

37. *Id.* at 458, 72 Cal. Rptr. at 491.

38. 99 N.J. Super. 323, 239 A.2d 680 (1968).

to submit to a voice recording in order that a spectrogram could be made from it and compared with one of an unknown caller. Kersta again testified that his process had the same accuracy as fingerprint identification, but the other state witness, Dr. Oscar Tosi, refused to give a firm opinion before further study had been conducted.³⁹ The testimony of two defense witnesses and the opinions expressed in thirty-nine letters admitted as evidence indicated a lack of the general scientific acceptance which the court required before it would take judicial notice of the process. The court said:

The legal criterion of "general scientific acceptance as a reliable means of ascertaining the truth" before judicial notice can be taken of the technique or aid involved, permitting its admissibility as evidence, accords with the standards set by almost all of the courts in this country that have passed on the issue, and most of them have. It is not for the law to experiment but for science to do so. . . All scientific aids and devices go through an experimental and testing stage, and during these stages there may be considerable scientific controversy. During this period of controversy over the technique and aid involved, the danger is that a trial actually may result in the trial of the technique rather than the trial of the issues involved in the case, if some less exacting rule is substituted for the time-honored rule of general scientific acceptance, realizing that there may, even after general acceptance, always be some lesser degree of doubt which time may or may not clarify. *United States v. Wright* . . . is an example.⁴⁰

While *Cary* was like *King* and the *Wright* dissent in requiring general scientific acceptance, it differed from those cases in apparently making judicial notice of the process a prerequisite to admissibility.

B. LATER CASES

Kersta's work was subjected to much criticism⁴¹ and Kersta had

39. Tosi's study had not yet been conducted. See Tosi, *supra* note 2.

40. *State v. Cary*, 99 N.J. Super. 323, 332, 239, A.2d 680, 684 (1968).

41. LADEFOGED, *supra* note 32, at 142:

We believe that Kersta has hoodwinked the press, the public, the law, and perhaps himself into believing his claims about "voiceprint" identification. He does this mainly by misleadingly reporting the results of a largely irrelevant experiment, and by making dogmatic assertions which he cannot substantiate. There is grave danger in the continued cultivation of the "voiceprint" mystique—the complex of transcendental, semi-mystical beliefs surrounding, and tending to endue with an esoteric and scientific truth value, the manipulation of snipped-up spectrograms.

admitted to one mistaken identification,⁴² but a major study⁴³ completed after the *Wright, King, and Cary* cases concluded that it had "confirmed the figures reported by Kersta in 1962."⁴⁴ The scientist in charge of this study, Dr. Tosi, testified for the state in the case of *State ex rel. Trimble v. Hedman*⁴⁵ and *United States v. Raymond*.⁴⁶

The *Trimble* case was an appeal from an order discharging a writ of habeas corpus. The court held that an identification based on spectrogram examination is admissible in a hearing to determine justification for the issuance of an arrest and search warrant but emphasized that it was admissible only for the purpose of corroborating an aural identification.⁴⁷

Dr. Tosi testified that as a result of his comparison of more than 34,000 spectrograms over a period of about four years,⁴⁸ he was now of the opinion that the method was extremely reliable.⁴⁹ The defense witness, Dr. Peter Ladefoged,⁵⁰ said that he agreed with Tosi's results and that the scientific community accepted them with limitations, but the process was still too uncertain to be accepted by the courts. He

See Bolt, *supra* note 14; Stevens, *supra* note 32; Young and Campbell, *Effects of Context on Talker Identification*, 42 J. ACOUST. SOC. AMER. 1250 (1967).

42. "A company that specializes in identifying people by their voiceprints now says that its original identification of a high-ranking police official demoted during a corruption investigation was wrong." N.Y. Times, March 27, 1971, at 57, col. 2.
43. Tosi, *supra* note 2.
44. *Id.* at 2041.
45. *State ex rel. Trimble v. Hedman*, 291 Minn. 442, 192 N.W.2d 432 (1971).
46. *United States v. Raymond*, 337 F. Supp. 641 (D.D.C. 1972).
47. *State ex rel. Trimble v. Hedman*, 291 Minn. 442, 458, 192 N.W.2d 432, 441 (1971). The court added as dictum:

While we deal here with the sufficiency of proof to establish probable cause for the issuance of an arrest warrant, we are convinced that in the trial of the case spectrograms ought to be admissible for the purpose of corroborating voice identification by aural means if a sufficient foundation is laid to satisfy the trial judge that the expert whose opinion is sought is qualified to assist the factfinder in coming to the right conclusion. The qualification of an expert is normally left to the discretion of the trial judge and we think that ought to be the rule here as well as in other fields of scientific study.

48. See Tosi, *supra* note 2.
49. *State ex rel. Trimble v. Hedman*, 291 Minn. 442, 453-54, 192 N.W.2d 432, 438-39 (1971):

Q. Dr. Tosi, could you express an opinion as to the reliability of voiceprint examination by the Kersta voiceprint method by a trained examiner, who is given all of the time that he needs to make an examination, who listens to the spoken material as well as analyzes the voiceprint, who is allowed to grade and produce an opinion as to the reliability of what he is saying, who is given adequate and sufficient training in the manufacture of voiceprints and reading of voiceprints, who has a high degree of job responsibility and experience? Could you express an opinion as to the degree of reliability of such an examiner's opinion?

A. Well, yes, certainly. Providing that all these conditions that you have expressed, especially that the examiner is responsible and he is allowed to say, "Well, I don't know, I cannot produce in this case an identification," and only in those cases in which he is absolutely sure of his statement, I think that then the method is very highly extremely reliable.

50. See LADEFOGED, *supra* note 32.

agreed, however, that its use in conjunction with aural identification would make the latter more reliable. Dr. Ladefoged contended that Tosi's study had not used female voices, which were more difficult to compare but Tosi maintained that he could identify female voices as well as male voices.⁵¹ The court's rationale was similar to that in the *Wright* case:

It is common knowledge that the opinion of an expert on an identification subject is seldom so infallible that others in his field do not disagree with him. But disagreement alone does not make the opinion inadmissible. Where experts disagree, it is for the factfinder. . . to determine which is more credible. . . In the field of medicine, it is not unusual to have doctors disagree as to the cause or effect of an illness or accident.⁵²

The *Raymond* court held that spectrogram identification was admissible “. . . on the basis of the extensive Tosi study, his testimony in open court, and the opinions expressed by other experts. . .”⁵³ The court explained that Tosi's study had remedied the two major defects in Kersta's study⁵⁴ and that Tosi's approximate false identification rate of six percent would be further reduced by certain practices not employed by Tosi including the use of experienced examiners aided by recordings of the voices compared. The court also noted a substantial change in the scientific community's attitude toward the process, citing as an example Dr. Ladefoged, who had testified against admissibility in *Trimble* but who favored it in the case at bar. Ladefoged testified that the scientific community's views were substantially the same as those he had expressed in a letter admitted into evidence. The letter stated

51. *State ex rel. Trimble v. Hedman*, 291 Minn. 442, 456, 192 N.W.2d 432, 440 (1971). Appellant Trimble was a woman. Tosi's Michigan study had compared only male voices and he had recommended that it be “complimented by the testing of female voices. . .” See Tosi, *supra* note 2, at 2041.

52. *State ex rel. Trimble v. Hedman*, 241 Minn. 442, 192 N.W.2d 432 (1971).

53. 337 F. Supp. at 643.

54. First, Kersta was criticized for using a heterogeneous sampling of unknown voices, i.e., the spectrograms used represented speakers with different accents, of different ages and backgrounds, and that this fact made it easier to differentiate between speakers. Tosi, on the other hand, used a homogeneous sampling of 250 students at Michigan State University, each of whom was carefully screened by Tosi's associates from a group of over 25,000 students. Thus, the 250 selected each spoke what is referred to as non-accented, or General-American English, had no noticable speech defects, were all male, undergraduate students, and ranged in age from 19 to 34. The second major criticism of the Kersta experiment was that it was conducted using only closed testing groups, i.e., that the spectrogram of the unknown voice was always included in the group of known voices being used. Thus, in the Kersta test, all the examiner had to do was find the sample in the known group of spectrograms that most closely matched the spectrogram of the unknown voice in order to make an “identification”. Dr. Tosi, mindful of this defect, set up both open and closed experiments, i.e., in the open tests, the examiners were told that the spectrogram of the unknown voice may or may not be among the spectrograms of the known speakers.

Id.

that "in the past year various events have made me cautiously reconsider the possibility" of the use of spectrograms in legal proceedings; and later, "If I were asked to testify on the validity of the system, I would have to emphasize that we do not at the moment know the probable error rate. But I would accept a minimum of six percent as a rough estimate of the possibility of making a misidentification. . ."⁵⁵ Thus, when the court said that the basis for its decision included the opinions expressed by other experts, it was not adopting the general scientific acceptance test of admissibility, for, as Ladefoged's testimony and letter indicated, the scientific community had not yet become convinced of the value of the process as a forensic tool.

CONCLUSION

The courts in these cases have chosen with variations between two tests as a basis for their decisions on the admissibility of the process of voice identification based on spectrographic analysis: (1) general scientific acceptance and (2) judicial determination of accuracy and reliability.⁵⁶ Court adoption of the "general scientific acceptance" test is mandated by reasons which evolve primarily from the necessity of attaining some probative value in voice identifications based on this process.⁵⁷ Courts are not qualified to make the scientific judgments which they must make if they are to employ the "accuracy and reliability" test. Judicial determinations of the process' accuracy and reliability are based on the results of scientific studies and necessarily include judgments as to whether the studies relied upon have utilized scientifically valid methods. Judgments must be made regarding the validity of the variables tested, the number and selection of subjects, the training of examiners, the design and experimental procedures and the interpretation of results;⁵⁸ these judgments are more properly made by the scientific community than by the courts. Although the courts are required to determine when the process has in fact achieved general scientific acceptance when using that test, it is more logical that they undertake this task for it involves legal rather than scientific judgment.

Although the process validity can be attacked through cross-examination and contradictory testimony if admitted under the accuracy

55. Record Exhibit C, *United States v. Raymond*, 337 F. Supp. 641 (D.D.C. 1972).

56. Other scientific processes have been judged by these same tests. See Boyce, *Judicial Recognition of Scientific Evidence in Criminal Cases*, 8 UTAH L. REV. 313 (1964). Some jurisdictions have mandated the admissibility of the results of certain scientific processes by statute. See, e.g., MD. ANN. CODE art. 35, § 91 (1971).

57. But see Kamine, *The Voiceprint Technique: Its Structure and Reliability*, 6 SAN DIEGO L. REV. 213 (1969); See also Cedarbaums, *Voiceprint Identification: A Scientific and Legal Dilemma*, 5 CRIM. LAW BULL. 323 (1969).

58. See Tosi, *supra* note 2.

and reliability test, an even greater anomaly results because then the problem of making scientific judgments confronts the members of the jury who are even less equipped to deal with it than are the courts. Some jury members will disregard esoteric scientific testimony altogether,⁵⁹ while others relying on misleading terms such as "voiceprint" will give it more weight than it logically deserves.⁶⁰ Even under the general scientific acceptance test, the jury will be confronted with contradictory scientific testimony, but only on the point of disagreement as to whether or not spectrographic analysis has the general acceptance of the scientific community. However, if the courts couple the general scientific acceptance test with the requirement of judicial notice of the process,⁶¹ this problem will be minimized, for the majority of jurisdictions prohibit contradiction of an item that has been judicially noted.⁶² Since Dr. Tosi completed his Michigan study the process of voice identification based on spectrographic analysis has been viewed more favorably by certain scientists who had formerly opposed it,⁶³ but the courts should defer recognition of this process until it has received the acceptance of the general scientific community.

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59. Following the Arthur Bremer trial, the jury foreman said of the psychiatrists who had testified for both prosecution and defense, "They used so many big words... They couldn't agree. They were so evasive. You had to use horse sense." N.Y. Times, Aug. 5, 1972, at 40, col. 3.
60. "We doubt that the reliability of voice identification can ever match that of fingerprint identification." Bolt, *supra* note 14, at 600. "Differences between them seem to exceed similarities." Bolt, *supra* note 14, at 599.
61. See *State v. Cary*, 99 N.J. Super. 323, 239 A.2d 280 (1968).
62. *Nicketta v. National Tea Co.*, 338 Ill. App. 159, 87 N.E.2d 30 (1949); Proposed Rules of Evidence for the U.S. District Courts and Magistrates 201(g) and accompanying note.
63. See note 56 *supra*.