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COMMENTS

EXPERT TESTIMONY AND VOICE SPECTROGRAM ANALYSIS

United States v. Baller, 519 F.2d 463 (4th Cir. 1975)

Petitioner was convicted by a jury on four counts of telephoning bomb threats in violation of the Federal Bomb Threat Statute. He appealed, claiming prejudicial error from denial of his pretrial motion to suppress expert testimony identifying his voice by spectrogram analysis. The Court of Appeals for the Fourth Circuit affirmed and held: Expert opinion based on scientific techniques is admissible provided the techniques involve a "demonstrable, objective procedure" that may be duplicated or criticized by other experts.

Voice spectrogram analysis is a recently developed scientific tech-
nique which can identify a person by analysis of his voice.⁶ An exemplar of an individual's voice is tape-recorded.⁷ The exemplar and the tape-recording containing the unknown voice are fed into the spectrograph machine which scans the two tapes and makes graphic representations of the two speech patterns.⁸ An examiner then visually compares the graphs and listens to the tapes to determine whether one voice made both speech impressions.⁹ The technique was considered unreliable¹⁰ until, in 1972, Dr. Oscar Tosi¹¹ of Michigan State Universi-

(1969). It was not until the 1960's, however, that Lawrence G. Kersta, an electrical engineer and physicist employed at the Bell Laboratories, developed the voice spectrogram technique. State v. Cary, supra at 328, 239 A.2d at 682.

6. There are two methods of voice identification: aural recognition and voice spectrogram analysis. The former has long been held admissible into evidence. See, e.g., Mack v. State, 54 Fla. 55, 44 So. 706 (1907) (rape victim identified accused attacker solely from having heard his voice). See generally 2 J. WIGMORE, A TREATISE ON THE ANGLO-AMERICAN SYSTEM OF EVIDENCE IN TRIALS AT COMMON LAW § 660 (3d ed. 1940) [hereinafter cited as WIGMORE]; Annot., 70 A.L.R.2d 995 (1960).

7. The United States Supreme Court has held that compelling an accused to repeat words for voice identification is not violative of the fifth amendment protection against self-incrimination. The Court reasoned that this procedure did not involve testimonial compulsion, but rather was an identification of physical characteristics. United States v. Wade, 388 U.S. 218, 222-23 (1967); accord, United States v. Dionisio, 410 U.S. 1 (1973); see People v. Ellis, 65 Cal. 2d 529, 533-34, 421 P.2d 393, 394-95, 55 Cal. Rptr. 385, 386-87 (1966). See generally Schmerber v. California, 384 U.S. 757 (1966).

8. The graph portrays three aspects of sound and their correlative components in human speech. The horizontal axis of the graph charts time, a constant that is particularized by the timing of the individual's speech. The vertical axis measures frequency, the number of sound vibrations in a specific time period, perceived by a listener as pitch. The plotting line of the graph varies in darkness, representing the intensity of the voice, recognized by a listener as loudness. Kamine, supra note 5, at 218-20; 56 MINN. L. REV. 1235, 1239 (1972), citing M. HECKER, SPEAKER RECOGNITION: AN INTERPRETIVE SURVEY OF THE LITERATURE 50-51 (Am. Speech & Hearing Ass'n Monograph No. 16, 1971).

9. The most extensive study found that the error rate using only visual inspection of the spectrograms was six percent. The study noted, however, that allowing the expert examiner both to listen to the tape and to analyze the spectrograms visually reduced the error rate to two percent. Tosi, Oyer, Lashbrook, Pedrey, Nicol & Nash, Experiment on Voice Identification, 51 J. ACoust. Soc. Am. 2030, 2037, 2041 (1972) [hereinafter cited as Tosi].

10. The first scientific study of the technique claimed that voice spectrogram analysis was a perfectly reliable method of voice identification. Kersta, Voiceprint Identification, 196 NATURE 1253, 1253 (1962). Kersta, however, was criticized for failing to disclose the methodology of his experiments, thus preventing reproduction and verification of his results. In addition, he was attacked because his laboratory simulations did not reflect actual conditions. See Ladefoged & Van Derslice, The "Voiceprint Mystique," WORKING PAPERS IN PHONETICS 7 (1967). Kersta was further criticized for using only closed speaker groups, that is, the spectrogram of the unknown voice was always included in the group of spectrograms of test voices, and the examiner was aware.

published a study claiming voice spectrogram analysis was 98 percent accurate, a figure comparable to the reliability of other scientific techniques that are regularly used to develop admissible expert opinion.

The admissibility of evidence is largely within the discretion of the trial judge. Opinions of qualified experts are admissible into evidence of its presence. United States v. Raymond, 337 F. Supp. 641, 643 (D.D.C. 1972), aff'd on other grounds sub nom. United States v. Addison, 498 F.2d 741 (D.C. Cir. 1974). Since Kersta was not only the innovator of the process, but was producing and selling the spectrograph machine, self-interest may have biased his results. Cederbaums, Voice-print Identification: A Scientific and Legal Dilemma, 5 CRIM. L. BULL. 323, 328 (1969). As a result of these criticisms, the scientific community generally concluded that the reliability of voice spectrogram analysis had been insufficiently proven. Bolt, Cooper, Denes, Pickett & Stevens, Speaker Identification by Speech Spectrograms: A Scientists' View of Its Reliability for Legal Purposes, 47 J. ACoust. Soc. AM. 597, 603 (1970).

The study, conducted over a period of two and one-half years, involved 250 speakers and 50,000 spectrograms. It corrected a major defect of Kersta's work, see note 10 supra, by using open groups, that is, the spectrogram of the unknown voice was not necessarily included in the spectrograms of all the test voices. Based on the results of these experiments, Dr. Tosi concluded that an experienced operator, such as Lt. Nash, could correctly identify a speaker 94 percent of the time, and suggested that with certain refinements, see note 9 supra, the percentage could be increased to 98 percent. Tosi 2041; see 56 MINN. L. REV. 1235, 1241-44 (1972).

Ballistics testing is also said to be 100 percent accurate. A bullet may contain as many as 100 individual characteristics that can be compared with the exemplar, so that there will be a sufficient number of points for matching. Inbau, Scientific Evidence in Criminal Cases: III. Fingerprints and Palm-prints, 25 J. CRIM. L. & C. 500, 502 (1934). Generally, absolute identification requires that there be 12 or more points of identity between the exemplar and the evidence print. Fewer points of identity create only a presumption whose strength is dependent on the number and clarity of the points. Id. at 502, 503.

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vidence as an exception to the general rule prohibiting opinion testimony by witnesses. When expert opinion is based upon a scientific technique, courts generally follow the standard of Frye v. United States. 1

When expert opinion is based upon a scientific technique, courts generally follow the standard of Frye v. United States (1923); United States v. Wainwright, 413 F.2d 796, 800 (10th Cir. 1969), cert. denied, 396 U.S. 1009 (1970); Fineberg v. United States, 393 F.2d 417, 421 (9th Cir. 1968); Leavitt v. Scott, 338 F.2d 749, 751 (10th Cir. 1964); Slough, Relevancy Unraveled, 5 KAN. L. REV. 1, 1-4, 11, 12 (1956).

Dean McCormick described the considerations governing qualifying a witness as an expert:

An observer is qualified to testify because he has firsthand knowledge of the situation or transaction at issue. The expert has something different to contribute. This is a power to draw inferences from the facts which a jury would not be competent to draw. To warrant the use of expert testimony, then, two elements are required. First, the subject of the inference must be so distinctively related to some science, profession, business or occupation as to be beyond the ken of the average layman . . . . Second, the witness must have sufficient skill, knowledge or experience in that field or calling as to make it appear that his opinion or inference will probably aid the trier in his search for truth. The knowledge may in some fields be derived from reading alone, in some from practice alone, or as is more commonly the case, from both.

C. McCormick, HANDBOOK OF THE LAW OF EVIDENCE § 13 (2d ed. 1972) (footnotes omitted) (emphasis added) [hereinafter cited as McCormick]. See also 7 Wigmore § 1923; Gair, Selecting and Preparing Expert Witnesses, 2 AM. JUR. TRIALS 585 (1964); Kirk, Locating Scientific and Technical Experts, 2 AM. JUR. TRIALS 293 (1964). An expert's qualification as an expert is an issue within the trial court's discretion which may be reviewed only for abuse. Fineberg v. United States, 393 F.2d 417, 421 (9th Cir. 1968); Formhals v. United States, 278 F.2d 43, 47 (9th Cir. 1960); Lelles v. United States, 241 F.2d 21, 26 (9th Cir.), cert. denied, 353 U.S. 974 (1957); McCormick § 13.


15. See 7 Wigmore §§ 1917, 1925.

16. See McCormick §§ 11, 13; 7 Wigmore §§ 1917, 1925.

17. 293 F. 1013 (D.C. Cir. 1923). The court held inadmissible expert testimony based on the results of the Marston systolic blood pressure deception test (polygraph test) because the technique
that such testimony is admissible only if the method has achieved "general acceptance" in its field. The Frye standard is intended to prevent

ha[d] not yet gained such standing and scientific recognition among physiological and psychological authorities as would justify the courts in admitting expert testimony deduced from the discovery, development, and experiments thus far made.

Id. at 1014. See note 18 infra.

18. 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.

293 F. at 1014 (emphasis added).


Some courts have liberalized the general acceptance rule. In ruling on the admissibility of the results of a Nalline test to determine narcotics addiction, a California court of appeals stated:

Each of the People's experts did admit on cross-examination that the medical profession generally is unfamiliar with the use of Nalline and therefore it cannot be truthfully said that the Nalline test has met with general acceptance by the medical profession as a whole . . . . Should this fact render the testimony inadmissible? We believe not. . . . It has been generally accepted by those who would be expected to be familiar with its use. In this age of specialization more should not be required.


juries from being unduly influenced by expert testimony based on questionable scientific techniques\(^\text{19}\) and to guarantee that there will be other experts available to judge the accuracy of the method.\(^\text{20}\) Prior to 1972, two of the three appellate courts that considered the issue excluded testimony based on the results of voice spectrogram analysis because the technique had not achieved the acceptance required by Frye.\(^\text{21}\) Since

whether unusually high amounts of succinylcholine chloride, a poison, were present in the deceased's body, the court reversed the burden of the Frye test:

The problem presented to the trial judge was, were the scientific tests performed by Umberger [a toxicologist who performed the chemical analysis] so unreliable and scientifically unacceptable that their admission into evidence was error.

223 So. 2d at 70 (emphasis added).


The court may on its own motion or on the motion of any party enter an order to show cause why expert witnesses should not be appointed, and may request the parties to submit nominations. The court may appoint any expert witnesses agreed upon by the parties, and may appoint expert witnesses of its own selection.

Rule 706(a) merely implements the court's well-established inherent powers to appoint expert witnesses when necessary. Ex parte Peterson, 253 U.S. 300 (1920); 9 Wigmore § 2484.

21. The first forensic use of voice spectrogram analysis involved the perjury of a New York policeman. See Note, Voiceprint Method of Identification—Reluctance of the Courts Toward Acceptance of Evidence, 12 N.Y.L.F. 501 (1966), citing People v. Straehle (index 9323/64 Sup. Ct., Westchester County 1966) (unpublished decision). State v. Cary, 99 N.J. Super. 323, 239 A.2d 680 (Super. Ct. 1968), aff'd per curiam, 56 N.J. 16, 264 A.2d 209 (1970), was the leading appellate decision on the issue before Prof. Tosi published the results of his experiments. The New Jersey Superior Court held that "[t]his technique [voice spectrogram analysis] has not . . . as of this date attained such degree of scientific acceptance and reliability as to be acceptable as evidence." 99 N.J. Super. at 333, 239 A.2d at 685. In People v. King, 266 Cal. App. 2d 437, 72 Cal. Rptr. 478 (1968), the court in a limited holding stated that the process "has not reached a sufficient level of scientific certainty to be accepted as identification evidence in cases where the life or liberty of a defendant may be at stake." Id. at 460, 72 Cal. Rptr.
publication of Dr. Tosi’s study, nine of eleven courts have admitted such testimony into evidence, finding that it met the Frye standard.22

Commentators have criticized the Frye test for unduly limiting the admissibility of testimony based upon scientific techniques.23 Dean McCormick suggested a less restrictive test that would admit “relevant conclusions” by an expert24 unless there were strong reasons for exclud-


24. “General scientific acceptance” is a proper condition for taking judicial notice of scientific facts, but not a criterion for the admissibility of scientific evidence. Any relevant conclusions which are supported by a qualified expert witness should be received unless there are other reasons for exclusion. . . .
ing the testimony. Under the McCormick standard the trier of fact is
given the sole responsibility of determining the reliability of the scientific
technique. Rule 702 of the new Federal Rules of Evidence adopts the
McCormick standard.

McCormick § 203, at 491.

Dean McCormick argued that this less restrictive standard would allow into evidence
expert opinion based upon the results of newly discovered scientific methods that would
otherwise be excluded under Frye:

If the courts used this approach, instead of repeating a supposed requirement
of 'general acceptance' not elsewhere imposed, [referring to the standard
applied to all other expert opinion] they would arrive at a practical way of
utilizing the results of scientific advances.

Id. (emphasis added).

25. "Probative value may be overborne by the familiar dangers of prejudicing or
misleading the jury, and undue consumption of time." Id. See E. Fisch, New York
Evidence 3-5 (1959); 1 E. Morgan, Basic Problems of Evidence 183-88 (1961);
J. Thayer, Preliminary Treatise on the Law of Evidence 264-65, 330 (1898);
Slough, supra note 14, at 15.

26. Since the McCormick standard dispenses with the requirement that the court
find the technique has achieved general scientific acceptance, once a witness is qualified
as an expert the reliability of his technique becomes an issue to be decided by the jury.
See McCormick § 53; 9 Wigmore § 2549.

27. The federal rule, which took effect on July 1, 1975, adopted a liberal approach:

If scientific, technical, or other specialized knowledge will assist the trier of
fact to understand the evidence or to determine a fact in issue, a witness quali-
ﬁed as an expert by knowledge, skill, experience, training, or education, may
testify thereto in the norm of an opinion or otherwise.

FED. R. EVID. 702 (emphasis added).

The Advisory Committee's Note to the Federal Rules of Evidence stated that
"[w]hether the situation is a proper one for the use of expert testimony is to be deter-
mined on the basis of assisting the trier" of fact. Advisory Committee's Note, Fed. R.
House Judiciary Committee on rule 702, Mr. Edward Cleary, the reporter for the Ad-
visory Committee, stated that the "test is phrased in terms of helpfulness in understand-
ing the evidence and determining facts in issue." Hearings on H.R. 5463 Before the
Special Subcommittee on Reform of Federal Criminal Laws of the House Committee on
the Judiciary, 93d Cong., 2d Sess. 256 (1973). The new Federal Rules of Evidence,
then, adopt a much less rigorous standard of "assisting the trier of fact" to replace the
Frye requirement of "general scientific acceptance."

In adopting the standard advocated by Dean McCormick, the new Federal Rules of
Evidence are following the broad test suggested in 1949 by the Model Code of Evidence:
"In testifying to what he has perceived [an expert] witness ... may give his testimony
in terms which include inferences and may state all relevant inferences ... ." Model

Uniform Rule 56 is not as broadly stated, and instead grants the judge a broad discre-
tionary power to exclude expert testimony:

If the witness is testifying as an expert, testimony of the witness in the form
of opinions or inferences is limited to such opinions as the Judge finds are (a)
based on facts or data perceived by or personally made known to the witness
at the hearing. . . .

Uniform Rules of Evidence rule 56(2) (1953) (emphasis added).

In United States v. Baller, the Fourth Circuit acknowledged that not every scientific technique should be recognized as the basis for an expert's testimony since opinions based on scientific techniques often carry "undue weight with the trier of fact" and are difficult to rebut without the use of testimony of other experts. The court, however, rejected the Frye test, stating that the standard of admissibility should not require a general consensus in the scientific community. Instead, the court adopted the McCormick standard, adding two protective conditions: there must be "a demonstrable, objective procedure for reaching the opinion" and "qualified persons who can either duplicate the result or criticize the means by which it was reached." The court explained that these additional requirements were devised "to prevent deception or mistake and to allow the possibility of effective response." Since "'every useful new development must have its first day in court,'" the court concluded that testimony based upon relevant scientific evidence should be admitted in the same manner as other expert testimony, and its weight attacked by cross-examination and refutation.

The Baller opinion is commendable for balancing the great impact that scientifically grounded testimony may have on the jury against the need for admitting into evidence testimony based on the results of newly developed scientific techniques. The standard of admissibility devised by the court, however, was insufficient to protect against the probative dangers of expert testimony based on voice spectrogram analysis. First, by leaving the jury the task of assessing the weight of

28. 519 F.2d 463 (4th Cir. 1975).
29. Id. at 466. See note 21 supra.
30. 519 F.2d at 466.
32. 519 F.2d at 466.
33. Id. The court felt that even though the defense presented no expert rebuttal witnesses this requirement was met because "[c]ompetent witnesses were available to expose its limitations, and the defense was furnished with the names of other experts who could conduct their own analyses of the tapes." Id.
34. Id., citing United States v. Addison, 498 F.2d 741 (D.C. Cir. 1974); United States v. Amaral, 488 F.2d 1148 (9th Cir. 1973); United States v. Stifel, 433 F.2d 431 (6th Cir. 1970), cert. denied, 401 U.S. 994 (1971). Although these cases discussed the Frye test extensively, they applied the standard without any additional requirements.
36. 519 F.2d at 466.
37. See note 19 supra.
38. See note 24 supra.
the evidence the court assumed a sophistication that juries may not possess. Second, voice spectrogram analysis, a relatively new field, has a very limited number of experts so that the court's requirement that there be qualified persons available to challenge expert opinion may not be satisfied. Finally, Dr. Tosi's study of the reliability of voice spectrogram analysis significantly influenced the court. The study has been strongly criticized and should not have been considered conclusive without independent verification.

39. The jury evolved because of the public's hesitance "to entrust plenary powers over the life and property of the citizen to one judge or to a group of judges." United States v. Alexander, 526 F.2d 161, 168 (8th Cir. 1975), quoting Duncan v. Louisiana, 391 U.S. 145, 156 (1968). Nevertheless, [t]he jury's potential for inaccuracy surpasses that of any other legal institution assigned a decision-making task. Since it is convened on an ad-hoc basis to sit in one or a few cases, it lacks even the kind of general competence in weighing evidence and deliberation that judges acquire by training and continuity of service.


40. See note 5 supra.

41. The number of voice spectrogram experts who have testified in the reported cases is small: L. Gerstman, C.U.N.Y.; L. Kersta, Voiceprint Laboratories, Somerville, New Jersey; P. Ladefoged, U.C.L.A.; E. Nash, Michigan State Police; and O. Tosi, Michigan State University.

42. With such a small number of voice spectrogram experts it is not surprising that in approximately 80 percent of the reported cases in which such testimony was admitted there was no expert witness called by the defense to rebut or contradict the government's witnesses. People v. Chapter, 13 Crim. Law Rptr. 2479 (Marin County, Cal., Super. Ct. July 23, 1973). But see People v. King, 266 Cal. App. 2d 437, 72 Cal. Rptr. 478 (1968) (seven defense witnesses, experts in the general field of acoustics, questioned the reliability of spectrogram analysis).

43. The court approvingly cited Dr. Tosi's results published in 1972, and took special notice of his claim of 98 percent accuracy for the technique:

[Ex]tensive experiments on voice spectrography has [sic] been conducted at Michigan State University by Dr. Oscar Tosi . . . . It appears . . . that an experienced operator would incorrectly identify a speaker approximately six percent of the time. Subsequently, Dr. Tosi suggested refinements, employed by Lt. Nash, which reduce the percentage of mistaken identifications to about two percent. 519 F.2d at 465.

44. See Hazen, Effects of Differing Phonetic Contexts on Spectrographic Speaker Identification, 54 J. Acoust. Soc. Am. 650, 658, 659 (1973). Hazen concluded that "the forensic value of voice spectrograms for speaker identification purposes is quite limited." Id. at 659. He specifically criticized Dr. Tosi's preparation of speech samples and the substantial repetition of the known speaker contexts. Id. Other acoustical experts found fault with Dr. Tosi's selection of speaker population and the experiment's background noise conditions, and concluded: "Our interpretations of the new data lead us to reiterate our previous conclusion: that the degree of reliability of identification under practical conditions has not been scientifically established." Bolt, Cooper, David, Denes, Pickett & Stevens, Speaker Identification by Speech Spectro-
Despite these problems in the court's reasoning, the Bailer opinion is important in two respects. First, the court's adoption of the McCormick test is a significant departure from precedent, and opens the door of the Fourth Circuit to the admission of testimony based upon other scientific techniques. Second, since rule 702 of the new Federal Rules of Evidence adopts the McCormick standard, Bailer may indicate how other courts will apply the rule. Other scientific techniques, such as polygraph testing, that in the past have been excluded under the Frye test may be ruled admissible when freshly reviewed under the McCormick standard and rule 702.


45. See note 27 supra.

46. The most obvious example of a scientific technique that in the past has not been admitted in evidence under the Frye standard is polygraph testing. For an excellent summary of recent decisions that have held inadmissible the results of a polygraph examination, see United States v. Alexander, 526 F.2d 161 (8th Cir. 1975). The polygraph machine is actually a combination of devices that measure fluctuations in a person's blood pressure, breathing, perspiration, and pulse. See J. Reid & F. Inbau, supra note 18, at 3; J. Richardson, supra note 15, at § 10.1; Skolnick, supra note 13, at 696. The theory of polygraph testing is that a person's physiological state will reflect the emotional state inherent in giving a wrong response to a question. Skolnick, supra note 13, at 699-700. Even though the theory underlying the technique, the qualification and methodology of the operator, and the reliability of the procedure have been the subject of the closest scrutiny, see McCormick § 207, the most common justification for the uniform rejection of expert testimony based on the results of a polygraph examination is that the technique is unreliable. H.R. Rep. No. 198, 89th Cong., 1st Sess. 13 (1965). An accuracy rate of 95 percent has been reported for polygraph testing, see F. Inbau & J. Reid, supra note 13, at 72, a figure courts might find comparable to the 98 percent rate claimed for voice spectrogram analysis in the experiment done by Dr. Tosi, see note 12 supra. Under the McCormick standard, then, expert opinion based on the results of a polygraph test may, like expert testimony based on the results of voice spectrogram analysis, be admissible in evidence. Since rule 702 of the Federal Rules of Evidence has adopted the McCormick standard, see note 27 supra, federal courts might admit the results of a polygraph examination. Accord, Rothstein, Some Themes in the Proposed Federal Rules of Evidence, 33 Fed. B.J. 16, 25 (1974).