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391 A.2d 364, 97 A.L.R.3d 201
James REED, Jr.
v.
STATE of Maryland.
No. 62.
Court of Appeals of Maryland.
Sept. 6, 1978.

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William T. Wood, Specially Assigned Public Defender, Rockville, for appellant.

Deborah K. Handel, Asst. Atty. Gen. (Francis B. Burch, Atty. Gen. and Clarence W. Sharp, Asst. Atty. Gen., Baltimore, on brief), for appellee.

Argued before MURPHY, C. J., and SMITH, DIGGES, LEVINE, ELDRIDGE and ORTH, JJ.

Reargued before MURPHY, C. J., and SMITH, DIGGES, LEVINE, ELDRIDGE, ORTH and COLE, JJ.
ELDRIDGE, Judge.

The issue in this criminal case is the admissibility of voice identification testimony[391 A.2d 365] based on the analysis of spectrograms, commonly described as "voiceprints."

In September 1974, a woman was raped, late at night, outside her home in Montgomery County, Maryland. She immediately entered a hospital for treatment and reported the incident to the police. The following afternoon, she received a telephone call from a person who identified himself as her assailant. The victim notified the Montgomery County Police Department, and the police attached a recording device to her

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telephone. During the next three days, the victim received and recorded seven telephone calls, all apparently placed by the original caller.

During the course of one of these telephone conversations, the victim's caller asked to have intercourse with her again. She offered instead to pay him \$1,000.00. In a subsequent conversation, she and the caller arranged for her to deliver \$1,000.00 to the locker room of the Greyhound Bus Station in the District of Columbia. She was to find the key of locker number 326 on top of an electrical "plug" box, place the money inside the locker, and return the key to its original location on the box. The victim then complied with her caller's instructions. Afterwards, the defendant James Reed appeared at the bus station, entered the locker room, picked up the key from the box, and proceeded toward locker 326. As he approached the locker, police officers, who had been watching the locker room from a hole drilled in the door between the locker and boiler rooms, emerged from the boiler room and arrested Reed. Reed was subsequently indicted on rape and other charges growing out of the same incident.

In May 1975, Reed was compelled to submit voice exemplars to the State's Attorney. Reed was required to repeat, into a telephone connected to a recording device, the words spoken to the victim by her assailant in the September 1974 telephone calls. These tapes, together with a composite recording of the calls made by the assailant, were then sent to the Voice Identification Unit of the Michigan State Police Department for spectrographic analysis and comparison. The results of this comparison were considered inconclusive, and in August 1975 Reed was required to submit another set of voice exemplars, again reading the words spoken by the assailant. These voice samples were also sent to Michigan for spectrographic analysis and comparison. This second test resulted in an alleged positive identification of Reed as the speaker on four of the seven calls made by the rapist. 1

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A pretrial suppression hearing on the admissibility into evidence of voice identification testimony based on spectrographic analysis was conducted in the Circuit Court for Montgomery County. After hearing evidence on the general validity and reliability of the spectrographic method of identification, the trial court ruled that the State could at Reed's criminal trial introduce expert testimony based on spectrographic analysis for the purpose of voice identification.

Reed was first brought to trial in October 1975. Voiceprint testimony was introduced, purportedly identifying Reed as the speaker who had placed the calls to the victim. After two and one-half days of deliberation, the jury was unable to reach agreement, and a mistrial was declared. In March 1976, Reed was again brought to trial, and voiceprint testimony was again introduced. In this second trial, Reed was found guilty of rape, unnatural and

perverted sex acts, robbery, verbal threats, and unlawful use of the telephone. Reed was sentenced to life imprisonment for the crime of rape and to lesser concurrent terms of imprisonment for the remaining crimes. The Court of Special Appeals affirmed the convictions, *Reed v. State*, 35 Md.App. 472, 372 A.2d 243 (1977). This Court then granted Reed's petition for a writ of certiorari to consider the trial [391 A.2d 366] court's admission of voiceprint evidence. We hold that the admission of this evidence was error. 2

The voiceprint technique, although of relatively recent origin, has been much discussed and described in cases and legal commentaries. 3 The process involves the use of a

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machine known as a spectrograph. This machine analyzes the acoustic energy of the human voice into three components time, frequency, and intensity and graphically displays these components by generating, through an electric stylus, a series of closely spaced light and dark lines, varying in position, on a sheet of electrically sensitive paper. The resulting graphic representation is what is called a spectrogram or "voiceprint." It reveals certain patterns or "formats" which correspond to the sounds which are analyzed. According to the testimony of Dr. Oscar Tosi, the State's principal witness at the suppression hearing and the most widely known proponent of the reliability of the voiceprint technique, 4 spectrography

"consists of comparing both aurally and visually spectrograms of a questioned voice and a known voice, and on the basis of the similarities to decide whether or not the two voices, the questioned and known voice are the same or belong to different persons."

Essentially, therefore, the task of spectrography is one of pattern matching. It is dependent on the individual judgment of the examiner. As stated by Dr. Tosi:

"I consider (spectrography) reliable only if the examiner is reliable and he adjusts to what the

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conditions are, and he is an honest person; and he is prone to use no opinion, but probability rather than positive identification in cases of some doubt. Then I consider this good. It is reliable and can be used only . . . under these circumstances. Otherwise it would be a disaster."

The examiner's task is complicated by what is termed "intra-speaker" variability, that is, the fact that individual speakers apparently do not say the same word in precisely the same way each time they utter it, and that spectrograms reflect this difference. According to Detective Sergeant Lonnie Smrkovski of the Michigan State Police, the examiner in the instant case, if a speaker were to utter the same word on fifty consecutive days, he would expect none of the resulting spectrograms to be [391 A.2d 367] identical. 5 It is maintained, however, that the differences between the separate utterances of an individual speaker are less than the differences between the utterances of different speakers, so that intra-speaker variations do not render identification impossible.

According to Sgt. Smrkovski, at least ten points of similarity must be noted between two speech samples before a positive identification can be achieved. Apparently, this is independent of the number of the speech samples being compared. In the instant case, Sgt. Smrkovski, after listening to the tapes submitted to him, selected 138 of the 2,162 words spoken for comparison and made spectrograms of these words. In this sample, Sgt. Smrkovski rated one comparison "excellent," twenty "very good," thirty-seven "good," and thirty-five "fair." These comparisons were the basis of his conclusion that Reed's voice and the voice of the victim's caller were the same.

A principal consideration with regard to the admissibility of expert testimony, according to Wigmore, is: "On This

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subject can a jury receive from This person appreciable help?" 7 Wigmore, Evidence § 1923 (Chadbourn rev. 1978). Clearly, this is dependent on the particular circumstances of each case. No rule or set of rules could be expressed for all cases which would adequately distinguish helpful expert testimony from that which is superfluous or worse. Accordingly, this Court has held that the determination of similar and related issues are generally matters within the sound discretion of the trial court. *Beahm v. Shortall*, 279 Md. 321, 340, 368 A.2d 1005 (1977); *Greenstein v. Meister*, 279 Md. 275, 283, 368 A.2d 451 (1977); *Radman v. Harold*, 279 Md. 167, 168, 367 A.2d 472 (1977), and cases there cited.

On the other hand, with particular regard to expert testimony based on the application of new scientific techniques, it is recognized that prior to the admission of such testimony, it must be established that the particular scientific method is itself reliable. *People v. Kelly*, 17 Cal.3d 24, 130 Cal.Rptr. 144, 549 P.2d 1240 (1976); *Jones, Danger Voiceprints Ahead*, 11 Am.Crim.L.Rev. 549, 554 (1973). See also *Shanks v. State*, 185 Md. 437, 440, 45 A.2d 85 (1945); 3 Wigmore, Evidence § 795 (Chadbourn rev. 1970).

On occasion, the validity and reliability of a scientific technique may be so broadly and generally accepted in the scientific community that a trial court may take judicial notice of its reliability. Such is commonly the case today with regard to ballistics tests, fingerprint identification, blood tests, and the like. See *Shanks v. State*, supra, 185 Md. at 440, 45 A.2d 85. Similarly, a trial court might take judicial notice of the invalidity or unreliability of procedures widely recognized in the scientific community as bogus or experimental. However, if the reliability of a particular technique cannot be judicially noticed, it is necessary that the reliability be demonstrated before testimony based on the technique can be introduced into evidence. Although this demonstration will normally include testimony by witnesses, a court can and should also take notice of law journal articles, articles from reliable sources that appear in scientific journals, and other publications which bear on the degree of acceptance by recognized experts that a particular process has achieved.

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People v. Law, 40 Cal.App.3d 69, 75, 114 Cal.Rptr. 708, 711 (1974).

The question of the reliability of a scientific technique or process is unlike the question, for example, of the helpfulness of particular expert testimony to the trier of facts in a specific case. The answer to the question about the reliability of a scientific technique or process does not vary according to the circumstances of each case. It is therefore inappropriate to view this threshold question of reliability as a matter within each trial judge's individual discretion. Instead, [391 A.2d 368] considerations of uniformity and consistency of decision-making require that a legal standard or test be articulated by which the reliability of a process may be established.

The test which has gained general acceptance throughout the United States for establishing the reliability of such scientific methods was first articulated in the leading case of *Frye v. United States*, 54 U.S.App.D.C. 46, 47, 293 F. 1013, 1014 (1923):

"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." (Emphasis supplied.)

That is to say, before a scientific opinion will be received as evidence at trial, the basis of that opinion must be shown to be generally accepted as reliable within the expert's particular scientific field. Thus, according to the *Frye* standard, if a new scientific technique's validity is in controversy in the relevant scientific community, or if it is generally regarded as an experimental technique, then expert testimony based upon its validity cannot be admitted into evidence.

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The identity of the relevant scientific community is, of course, a matter which depends upon the particular technique in question. In general, members of the relevant scientific community will include those whose scientific background and training are sufficient to allow them to comprehend and understand the process and form a judgment about it. In unusual circumstances, a few courts have held that the experts thus qualified might properly be from a somewhat narrower field. See *People v. Williams*, 164 Cal.App.2d Supp. 858, 331 P.2d 251 (1958).

This criterion of "general acceptance" in the scientific community has come to be the standard in almost all of the courts in the country which have considered the question of the admissibility of scientific evidence. See, e. g., *Rivers v. Black*, 259 Ala. 528, 68 So.2d 2 (1953); *Pulakis v. State*, 476 P.2d 474 (Alaska 1970); *State v. Valdez*, 91 Ariz. 274, 371 P.2d 894 (1962); *People v. Busch*, 56 Cal.2d 868, 16 Cal.Rptr. 898, 366 P.2d 314 (1961); *People v. Williams*, supra; *Brooke v. People*, 139 Colo. 388, 339 P.2d 993 (1959); *Kaminski v. State*, 63 So.2d 339 (Fla. 1953); *Salisbury v. State*, 221 Ga. 718, 146 S.E.2d 776 (1966); *State v. Linn*, 93 Idaho 430, 462 P.2d 729 (1969); *State v. Lowry*, 163 Kan. 622, 185 P.2d 147 (1947); *State v. Casale*, 150 Me. 310, 110 A.2d 588 (1954); *Commonwealth v. Fatalo*, 346 Mass. 266, 191 N.E.2d 479 (1963); *People v. Morse*, 325 Mich. 270, 38 N.W.2d 322 (1949); *State v. Kolander*, 236 Minn. 209, 52 N.W.2d 458 (1952); *State v. Stout*, 478 S.W.2d 368 (Mo. 1972); *Boeche v. State*, 151 Neb. 368, 37 N.W.2d 593 (1949); *State v. Arnwine*, 67 N.J.Super. 483, 171 A.2d 124 (1961); *State v. Trimble*, 68 N.M. 406, 362 P.2d 788 (1961); *People v. Alston*, 79 Misc.2d 1077, 362 N.Y.S.2d 356 (1974); *State v. Steele*, 27 N.C.App. 496, 219 S.E.2d 540 (1975); *State v. Swanson*, 225 N.W.2d 283 (N.D. 1974); *State v. Smith*, 50 Ohio App.2d 183, 362 N.E.2d 1239 (1976); *Henderson v. State*, 94 Okl.Cr. 45, 230 P.2d 495 (1951); *State v. Green*, 271 Or. 153, 531 P.2d 245 (1975); *United States v. Bruno*, 333 F.Supp. 570 (E.D. Pa. 1971); *Romero v. State*, 493 S.W.2d 206 (Tex.Cr.App. 1973); *State v. Woo*, 84 Wash.2d 472, 527 P.2d 271 (1974); *Puhl v.*

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Milwaukee Automobile Ins. Co., 8 Wis.2d 343, 99 N.W.2d 163 (1959). 6

[391 A.2d 369] Although *Frye v. United States*, supra, was a case involving the results of a lie detector examination, the test itself has been broadly applied, and judged the appropriate standard to apply to newly developed methods of scientific discovery. The *Frye* test has been invoked by courts in their consideration of, *Inter alia*, paraffin test, *Brooke v. People*, supra ; medical testimony regarding the cause of birth defects, *Puhl v. Milwaukee Automobile Ins. Co.*, supra ; breath analysis devices designed to test for intoxication, *People v. Morse*, supra ; truth serum injections, *State v. Linn*, supra ; blood tests, *People v. Alston*, supra ; neutron activation analysis, *State v. Stout*, supra ; gunshot residue tests, *State v. Smith*, supra ; Nalline tests for detection of narcotics use, *People v. Williams*, supra ; ink identification tests, *United States v. Bruno*, supra ; and hypnotism, *People v. Busch*, supra.

This Court in *Shanks v. State*, supra, although not citing the *Frye* case itself, recognized the standard of general scientific acceptance in connection with the admissibility of

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blood test evidence. Chief Judge Marbury there pointed out (185 Md. at 440, 45 A.2d at 86, emphasis supplied):

"In the early cases evidence of the tests was not admitted, because the courts here were not convinced of their General acceptance And reliability. See *State v. Damm*, 62 S.D. 123, 252 N.W. 7; *Beuschel v. Manowitz*, 241 App.Div. 888, 272 N.Y.S. 165. Blood tests are Now accepted everywhere, scientifically, as accurate, and the courts . . . have generally followed the same view."

Almost every state court that has considered voiceprint evidence in a reported opinion has applied the *Frye* or a similar standard in determining the question of its admissibility. See *Hodo v. Superior Court*, 30 Cal.App.3d 778, 784, 106 Cal.Rptr. 547, 550 (1973); *People v. Kelly*, 17 Cal.3d 24, 130 Cal.Rptr. 144, 549 P.2d 1240 (1976); *People v. Law*, supra; *People v. King*, 266 Cal.App.2d 437, 72 Cal.Rptr. 478 (1968); *Brown v. United States*, 384 A.2d 647 (D.C.C.A. 1978); *Worley v. State*, 263 So.2d 613, 614 (Fla.App. 1972); *Commonwealth v. Lykus*, 367 Mass. 191, 327 N.E.2d 671, 678 (1975); *People v. Tobey*, 401 Mich. 141, 257 N.W.2d 537 (1977); *State v. Cary*, 99 N.J.Super. 323, 239 A.2d 680, 685 (1968), Aff'd, 56 N.J. 16, 264 A.2d 209 (1970); *D'Arc v. D'Arc*, 157 N.J.Super. 553, 385 A.2d 278 (1978); *People v. Rogers*, 86 Misc.2d 868, 385 N.Y.S.2d 228, 237 (1976); *State v. Olderman*, 44 Ohio App.2d 130, 336 N.E.2d 442, 448 (1975); *Commonwealth v. Topa*, 471 Pa. 223, 369 A.2d 1277, 1281 (1977). Contra, *State ex rel. Trimble v. Hedman*, 291 Minn. 442, 192 N.W.2d 432 (1971) (scientific disagreement goes to weight, not admissibility); See also *Alea v. State*, 265 So.2d 96 (Dist.Ct.App. Fla. 1972) (issue not discussed).

The *Frye* test has been subjected to some criticism, primarily on the grounds that it is too conservative and unduly prevents or delays the admission of relevant scientific evidence. *United States v. Sample*, 378 F.Supp. 44, 53 (E.D.Pa. 1974); *McCormick*, Evidence § 203, pp. 490-491 (2d ed. 1972); Cf. *United States v. Baller*, 519 F.2d 463, 466 (4th Cir. 1975), Cert. denied, 423 U.S. 1019, 96 S.Ct. 456, 46 L.Ed.2d

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391 (1975). There are, however, compelling reasons which justify the *Frye* principle.

Fairness to a litigant would seem to require that before the results of a Scientific[391 A.2d 370] process can be used against him, he is entitled to a Scientific judgment on the reliability of that process. 7 As stated by Judge McGowan, speaking for the court in *United States v. Addison*, 162 U.S.App.D.C. 199, 201, 498 F.2d 741, 743-744 (1974):

"(T)he *Frye* standard retards somewhat the admission of proof based on new methods of scientific investigation by requiring that they attain sufficient currency and status to gain the general acceptance of the relevant scientific community. This is not to say, however, that the *Frye* standard exacts an unwarranted cost. The requirement of general acceptance in the scientific community assures that those most qualified to assess the general validity of a scientific method will have the determinative voice."

This is an especially significant consideration with regard to those scientific techniques in which highly subjective judgments are based upon the data received from sophisticated mechanical devices. In these circumstances, the apparent objectivity of the machine may suggest a degree of certainty inconsistent with the subjective aspects of the enterprise. 8 *United States v. Addison*, supra, 162 U.S.App.D.C. at 202, 498 F.2d at 744;

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People v. Kelly, supra. As the Supreme Court of California stated in *Kelly* (130 Cal.Rptr. at 149, 549 P.2d at 1245): ". . . *Frye* was deliberately intended to interpose a substantial obstacle to the unrestrained admission of evidence based upon new scientific principles. . . . Several reasons founded in logic and common sense support a posture of judicial caution in this area. Lay jurors tend to give considerable weight to 'scientific' evidence when presented by 'experts' with impressive credentials. We have acknowledged the existence of a '. . . misleading aura of certainty

which often envelops a new scientific process, obscuring its currently experimental nature.' (Huntingdon v. Crowley, supra, 64 Cal.2d 647 at p. 656, 51 Cal.Rptr. 254 at p. 262, 414 P.2d 382 at p. 390; . . .) As stated in Addison, supra, in the course of rejecting the admissibility of voiceprint testimony, 'scientific proof may in some instances assume a posture of mystic infallibility in the eyes of a jury' (United States v. Addison, supra, 498 F.2d at p. 744.)"

In addition to the advantage of substituting scientific for lay judgment as to scientific reliability, the court in United States v. Addison, supra, 162 U.S.App.D.C. at 202, 498 F.2d at 744, pointed out that the Frye test ". . . protects prosecution and defense alike by assuring that a minimal reserve of experts exists who can critically examine the validity of a scientific determination in a particular case. . . . (T)he ability to produce rebuttal experts, equally conversant with the mechanics and methods of a particular technique, may prove to be essential."

The dissenting opinion, however, suggests that instead we adopt the rule enunciated by McCormick, that "(a)ny relevant conclusions which are supported by a qualified expert witness should be received unless there are other reasons for exclusion." McCormick on Evidence S 203 at 491 (2d ed. 1972). McCormick, in opposition to the great weight of judicial

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authority, believes [391 A.2d 371] that disagreement in the scientific community regarding the reliability of a scientific process should go to the weight rather than the admissibility of scientific evidence.

This view seems to us unacceptable. It fails to recognize that laymen should not on a case by case basis resolve a dispute in the scientific community concerning the validity of a new scientific technique. When the positions of the contending factions are fixed in the scientific community, it is evident that controversies will be resolved only by further scientific analysis, studies and experiments. Juries and judges, however, cannot experiment. If a judge or jurors have no foundation, either in their experience or in the accepted principles of scientists, on which they might base an informed judgment, they will be left to follow their fancy. 9 Thus, courts should be properly reluctant to resolve the disputes of science. "It is not for the law to experiment but for science to do so," State v. Cary, supra, 99 N.J.Super. at 332, 239 A.2d at 684.

Nonetheless, under the McCormick standard, juries would be compelled to make determinations regarding the validity of experimental or novel scientific techniques. As a result, one jury might decide that a particular scientific process is reliable, while another jury might find that the identical process is not. However, the reliability of the underlying technique or process to perform as it is supposed to does not vary with different cases. Using the polygraph as an example, although particular polygraph tests may give different results under different circumstances, the basic validity of the polygraph technique in general to give the type of results which are claimed for it does not change with the facts of each case. Nevertheless, if the trier of facts is to determine the Validity of the polygraph test on a case by case basis, one judge or jury might determine that it is reliable and convict

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or acquit a defendant on the basis of the test results, whereas the very next judge or jury, sitting in the same courthouse and listening to the same operator giving the same type of test results, might determine that the technique is unreliable and ignore the results. Such inconsistency concerning the validity of a given scientific technique or process would be intolerable. See Commonwealth v. Sullivan, 146 Mass. 142, 145, 15 N.E. 491 (1888) (Holmes, J.).

Under the Frye test, however, this difficulty is largely avoided. As long as the scientific community remains significantly divided, results of controversial techniques will not be admitted, and all defendants will face the same burdens. If, on the other hand, a novel scientific process does achieve general acceptance in the scientific community, there will likely be as little dispute over its reliability as there is now concerning other areas of forensic science which have been deemed admissible under the Frye standard, such as blood tests, ballistics tests, etc.

In addition, there is a related danger under the McCormick view. The introduction of evidence based on a scientific process, not yet generally accepted in the scientific community, is likely to distract the fact finder from its central concern, namely the rendition of a judgment on the merits of the litigation. Without the Frye test or something similar, the reliability of an experimental scientific technique is likely to become a central issue in each trial in which it is introduced, as long as there remains serious disagreement in the scientific community over its reliability. Again and again, the examination and cross-examination of expert witnesses will be as protracted and time-consuming as it was at the trial in the instant case, and proceedings may well degenerate into trials of the technique [391 A.2d 372] itself. 10 The Frye test is designed to

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forestall this difficulty as well. As stated in State v. Cary, supra, 99 N.J.Super. at 332, 239 A.2d at 684:

"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 . . . the danger is that a trial may actually 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, . . ."

For the foregoing reasons, we agree with the "general acceptance" rule which the Frye Case sets forth.

Our adoption of the Frye standard does not, of course, disturb the traditional discretion of the trial judge with respect to the admissibility of expert testimony. Frye sets forth only a legal standard which governs the trial judge's determination of a threshold issue. Cf. *Radman v. Harold*, supra, 279 Md. at 169, 367 A.2d 472. Testimony based on a technique which is found to have gained "general acceptance in the scientific community" May Be admitted into evidence, but only if a trial judge also determines in the exercise of his discretion, as he must in all other instances of expert testimony, that the proposed testimony will be helpful to the jury, that the expert is properly qualified, etc. Obviously, however, if a technique does not meet the Frye standard, a trial judge will have no occasion to reach these further issues.

Turning to the admissibility of testimony based on the voiceprint process, prior to 1972 it was generally agreed that the voiceprint process had not been sufficiently tested and accepted to qualify its results for use in the courts. 11 The Technical Committee on Speech Communication of the Acoustical Society of America had requested six scientists in the field of acoustics to evaluate the voiceprint process. These

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scientists, Richard Bolt, Franklin Cooper, Edward David, Peter Denes, James Pickett and Kenneth Stevens, reported in 1970 that the voiceprint process was still in its experimental stage, and the reliability of the conclusions based on the data obtained from the process was uncertain (*Speaker Identification by Speech Spectrograms: A Scientists' View of Its Reliability for Legal Purposes*, 47 J. Acoustical Soc'y Am. 597, 603 (1970)):

"(T)he available results are inadequate to establish the reliability of voice identification by spectrograms. We believe this conclusion is shared by most scientists who are knowledgeable about speech; hence, many of them are deeply concerned about the use of spectrographic evidence in the courts."

In 1971 and 1972, Dr. Tosi and his associates published a series of papers concerning the results of an experiment conducted on the voiceprint process. 12 Subsequently, some courts, relying exclusively on the testimony of Dr. Tosi and his Michigan associates, admitted in evidence testimony based [391 A.2d 373] on the voiceprint process. See *State ex rel. Trimble v. Hedman*, 291 Minn. 442, 192 N.W.2d 432 (1971); *Worley v. State*, 263 So.2d 613 (Dist.Ct.App. Fla. 1972) (use for corroboration); *Alea v. State*, 265 So.2d 96 (Dist.Ct.App. Fla. 1972) (following *Worley*); *Hodo v. Superior Court*, 30 Cal.App.3d 778, 106 Cal.Rptr. 547 (1973). However, as observed by Judge Kaplan, dissenting in *Commonwealth v. Lykus*, 367 Mass. 191, 327 N.E.2d 671, 680 (1975):

"It can fairly be said, however, that when the cases were decided the scientific community had not had

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sufficient time to study Dr. Tosi's work and reach conclusions as to its possible advance over the previous work in the field. See *People v. Law*, 40 Cal.App.3d 69, 81-82, 114 Cal.Rptr. 708 (1974). The decisions thus reflected less a consensus in the relevant scientific community that the Tosi method was acceptable, than an absence of study on which an informed opinion could be based one way or the other."

In 1973, Bolt, Cooper, David, Denes, Pickett and Stevens again addressed the voiceprint issue, in light of the Tosi experiment. 13 The authors expressed their concern about certain aspects of the Tosi experiment. They mentioned the Tosi experiment's failure to consider the problems of mimicking or disguising of voices, changes in voice levels, and changes due to stress or other emotional states of the speaker. They expressed further concern over the increase in error rates in comparing voice samples taken at different times, as well as the increase of error in other circumstances. The authors concluded, Bolt, et al., *Speaker Identification by Speech Spectrograms: Some Further Observations*, 54 J. Acoustical Soc'y Am. 531, 533-534 (1973):

"The Tosi study has improved our understanding of some of the problems of voice identification from spectrograms by indicating the influence of several important variables on the accuracy of identification. In uncovering factors that tend to increase identification errors, however, the study has not given us a definitive answer to the question: 'How reliably can a person be identified by examining the spectrographic patterns of his speech sounds?' Under certain laboratory conditions and for some selected sample of the population, the probability of making an error in identification can be stated. But for the less-than-ideal conditions encountered in

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forensic situations, the indications are that the probability of error will increase substantially. Further studies are needed, with particular attention to the examiner's decision criteria, the selection of speaker population, the time lapse between voice samples, background-noise conditions, and the psychological condition of the speaker.

"As scientists rather than lawyers, we offer no judgment as to whether or to what extent speech spectrograms should be used for identification in the courts. We wish only to point out that present methods for such use lack an adequate scientific basis for estimating reliability in many practical situations and that laboratory evaluations of these methods show increasing errors as the conditions for evaluation move toward real-life situations. We hope that our explanations of some of the factors that affect speaker identification will provide the legal profession with helpful information on which to base its own judgments concerning the admissibility of the spectrographic method."

The testimony in the instant case indicates that the fundamental division in the scientific community reflected in these articles has continued without substantial abatement. On direct examination of Dr. Tosi, he acknowledged the division in the scientific community concerning the validity of the voiceprint process:

"Q. How many experts within the field of sound spectrography that have used that process for voice identification oppose that process, who have done actual work in that field?

[391 A.2d 374] "A. In addition to the six authorities of Bolt, et al., and none of them worked in voice identification, Stevens had some nine years ago a small experiment. There are three others that oppose it that have done some work not too much. Some of them have no professional basis. Let's say five of them, to the best of my knowledge.

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"Q. How many of the experts within the field of sound spectrography for voice identification are in favor of that process?

"A. At least I can give the names of at least 15, and among them very prominent scientists." 14

Later, asked about the division of experts, excluding those professionally engaged in the field of voice identification, Tosi testified:

"A. Okay, five were opposed from this reduced group of persons that I said at least have published or done something but were not professionally engaged in the field. I say it is a rough number. Persons that I know of that have done some experimentation or have published, I said less than ten; five opposed four or five are in favor. . . .

"Q. You are not including Dr. Bolt and his group, are you?

"A. No, I am not."

Additional expert witnesses who testified for the State, in the instant case, were Sgt. Smrkovski, Dr. Peter Jansen and Dr. John A. McClung. Their testimony was consistent with

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that of Dr. Tosi in acknowledging the division in the scientific community.

Dr. Donald Baker, an expert witness called by the defense, 15 testified that spectrography was neither a reliable process nor generally accepted within the scientific community. Dr. Baker cited two samplings of opinion of the scientific community, both of which had been unfavorable toward the validity of the process. The first was a meeting in which the members of the Speech Communications Section of the Acoustical Society of America voted 42-0 against the efficacy of the procedure. The second was a mail survey, as reported in a scientific journal, which resulted in an unfavorable reaction. Dr. Baker also noted that the majority of articles on the subject were negative in their characterization of the process.

The extent of disagreement in the scientific community was emphasized in the instant case by the testimony of Dr. Henry Hollien, another expert witness for the defense, 16 who stated:

[391 A.2d 375] "I have conducted or directed about six major studies using (the voiceprint) technique.

"One of the things we have done, and we are the only people who have done this . . . we have applied our technique to . . . (simulated crimes), and it of course doesn't work.

"There was nothing wrong with trying to use it (the technique). It failed. Now it is an abuse.

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"Q. It is an abuse because you feel there are some people not qualified to use it?

"A. No, no. It is the data. See, I don't think the people that use it know about the research literature. . . . There are many studies that have been published which show the problems with this. There is a huge literature that would demonstrate why they should back off, put a moratorium on this until we have some knowledge, and not foster this upon the judicial system and law enforcement agencies. It amounts to a fraud. I don't think they realize it. They don't know what is going on, you see." (Emphasis added.)

There has been a sharp division among the cases which have considered the admissibility of voiceprint evidence after the emergence of the controversy over Tosi's claims.

Three state supreme courts, California, Michigan and Pennsylvania, have held the evidence inadmissible. *Commonwealth v. Topa*, supra; *People v. Kelly*, supra; *People v. Tobey*, supra. In addition, the District of Columbia Court of Appeals, in *Brown v. United States*, 384 A.2d 647 (D.C. 1978), has also held voiceprint evidence inadmissible. On the other hand, the Supreme Court of Massachusetts has, in a divided opinion, held the evidence admissible, *Commonwealth v. Lykus*, supra. And See *State v. Williams*, 388 A.2d 500 (Me. 1978).

Two lower state courts have recently ruled voiceprint evidence admissible: *People v. Rogers*, 86 Misc.2d 868, 385 N.Y.S.2d 228 (1976); and *State v. Olderman*, 44 Ohio App.2d 130, 336 N.E.2d 442 (1975). However, in *D'Arc v. D'Arc*, 157 N.J.Super. 553, 385 A.2d 278 (1978), the New Jersey Superior Court ruled voiceprint evidence inadmissible.

In the United States Courts of Appeal, voiceprint evidence has been held inadmissible in *United States v. Addison*, supra, and admissible in *United States v. Baller*, supra, and *United States v. Franks*, 511 F.2d 25 (6th Cir. 1975), Cert. denied, 422 U.S. 1042, 95 S.Ct. 2654, 45 L.Ed.2d 693 (1975).

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All cases holding voiceprint evidence inadmissible have done so on the ground that the process fails to satisfy the standard articulated in *United States v. Frye*, supra. It is important to note, however, that neither *United States v. Baller*, supra, nor *United States v. Franks*, supra, in holding voiceprint evidence admissible, seemed to apply the Frye test. In *Franks*, the court stated (511 F.2d at 33):

"Although we, of course, are aware of the differences of . . . scientific opinion concerning the use of voiceprints, we also are mindful of 'a considerable area of discretion on the part of the trial judge in admitting or refusing to admit' evidence based on scientific processes." (Emphasis supplied.)

Similarly, in *United States v. Baller*, supra, the court, after considering the Frye standard, stated (519 F.2d at 466):

"Unless an exaggerated popular opinion of the accuracy of a particular technique makes its use prejudicial or likely to mislead the jury, it is better to admit relevant scientific evidence in the same manner as other expert testimony and allow its weight to be attacked by cross-examination and refutation."

The Massachusetts Supreme Court held that voiceprint analysis did satisfy the Frye standard. In *Commonwealth v. Lykus*, supra, 327 N.E.2d at 678 n. 6, that court stated:

[391 A.2d 376] "(W)e agree that there certainly is not uniform and total acceptance of the (voiceprint) method (in the scientific community) Yet the . . . Frye standard does not require unanimity of view, only general acceptance; a degree of scientific divergence of view is inevitable. In this case we are disposed to give greater weight to those experts who have had direct and empirical experience in the field of spectrography. . . .

"Thus, we find the evidence presented in support of the reliability of voiceprints, particularly as

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expressed in Dr. Tosi's study, sufficiently persuasive to outweigh the criticism expressed by certain other scientists in the field of acoustics."

Nevertheless, it is not fully clear whether the Massachusetts court was, consistent with the Frye standard, deciding that the voiceprint method is generally accepted by the scientific community or whether it was attempting itself to determine the merits of the claims of the various scientists. In any event, we find ourselves more in agreement with Judge Kaplan, dissenting in *Commonwealth v. Lykus*, supra, 327 N.E.2d at 682, who stated:

"To sum up, opinion is divided on the Tosi method; the journal material shows turbulence and discord rather than that 'general acceptance' which the Frye case lays down as a precondition of admissibility. Nor can it be plausibly said that those with adverse views are either unqualified to have opinions worthy of respect or are strangers to the relevant scientific 'field.' "

Furthermore, we disagree with the Massachusetts court's characterization of the nature of the dispute. A degree of scientific divergence of opinion is indeed inevitable, but the degree of divergence surrounding the voiceprint process is fundamental and goes to the very validity of the process itself. This kind and degree of divergence is notably absent in other areas of scientific evidence generally deemed admissible. As stated in Comment, *The Voiceprint Dilemma: Should Voices Be Seen and Not Heard?*, 35 Md.L.Rev. 267, 280 n. 79 (1975):

"(E)xperts may disagree as to the application of a technique, or as to the results of that application, But they do not generally question that the technique is capable of producing the results claimed. For instance, it is common knowledge that psychiatric diagnoses are often at odds with each other, and it is easy to picture experts disputing whether two writing samples came from the same hand. It is

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much more difficult to imagine experts disputing whether psychiatric diagnoses or handwriting identifications are possible with any significant degree of reliability. Yet that is precisely the nature of the voiceprint dispute; experts question the capability of the process itself, not just the results of its application." (Emphasis supplied.)

In addition, it is the almost unanimous opinion in recent legal commentaries that the voiceprint technique does not satisfy the standards articulated in *Frye v. United States*. See, e. g., Comment, *The Voiceprint Dilemma: Should Voices Be Seen and Not Heard?* supra ; Comment, *Voiceprints: The End of the Yellow Brick Road*, 8 U.S.F.L.Rev. 702 (1974); Jones, *Danger Voiceprints Ahead*, 11 Am.Crim.L.Rev. 549 (1973); Jones, *Evidence Vel Non The Non Sense of Voiceprint Identification*, 62 Ky.L.J. 301 (1974); Note, *Voiceprint Identification*, 61 Geo.L.J. 703 (1973); Thomas, *Voiceprint Myth or Miracle (The Eyes Have It)*, 3 U.San Fern.V.L.Rev. 15 (1974). Even those authors who advocate the admissibility of voiceprint evidence appear to concede that it does not meet the *Frye* test and argue instead for alternative revised standards under which it might be admissible. See, e. g., Decker and Handler, *Voiceprint Identification Evidence Out of the Frye Pan and into Admissibility*, 26 Am.U.L.Rev. 314, 361-365 (1977); Greene, *Voiceprint Identification: The Case in Favor of Admissibility*, 13 Am.Crim.L.Rev. 171, 195-197 (1975).

Despite this array, the trial court in the instant case determined that spectrography had achieved the standard of acceptance [391 A.2d 377] needed for admissibility. However, the trial court, in holding voiceprint evidence admissible, construed the *Frye* test to require "general acceptance . . . within the group actually engaged in the use of this technique and in the experimentation with this technique. . . . (W)e are restricting the relevant field of experts to those who

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are knowledgeable, directly knowledgeable through work, utilization of the techniques, experimentation and so forth, that we are not taking the broad general scientific community of speech and hearing science. In that broad community there probably is not acceptance."

We have serious doubts that voiceprint analysis meets even this reduced standard. Tosi's own testimony indicates substantial division of opinion among those who have done work or performed experiments relating to the voiceprint process.

In any event, we find that the trial court's formulation is inconsistent with the proper standard of acceptance necessary for admissibility. The circumstances of the instant case suggest no basis for "restricting the relevant field of experts" to those who have performed voiceprint experiments, and eliminating from consideration the opinions of those scientists in the fields of speech and hearing, as well as related fields, who, by training and education, are competent to make professional judgments concerning experiments undertaken by others. The purpose of the *Frye* test is defeated by an approach which allows a court to ignore the informed opinions of a substantial segment of the scientific community which stands in opposition to the process in question.

Thus, based on our examination of the record in the instant case, the judicial opinions which have considered this question, and the available legal and scientific commentaries, we do not believe that "voiceprint" analysis has achieved the general acceptance in the scientific community, at this time, which is required under *Frye*. We therefore hold that testimony based on "voiceprints" or spectrograms is, for the present, inadmissible in Maryland courts as evidence of voice identification. This holding is, of course, subject to reconsideration by this Court if the use of spectrograms or some other technique of voice identification does in the future

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achieve the general acceptance of the scientific and legal communities.

JUDGMENT OF THE COURT OF SPECIAL APPEALS REVERSED, AND CASE REMANDED TO THAT COURT WITH DIRECTIONS TO REVERSE THE JUDGMENT OF THE CIRCUIT COURT FOR MONTGOMERY COUNTY AND REMAND THE CASE FOR A NEW TRIAL. MONTGOMERY COUNTY TO PAY COSTS.

SMITH, Judge.

I respectfully dissent. I believe the Court of Special Appeals was correct in holding that the expert might testify that in his opinion the voice of the person making the telephone calls in question was that of Reed. My dissent is based upon a number of reasons, not necessarily in the sequence in which I list them: (1) The rule enunciated in *Frye v. United States* (the *Frye* test), 54 App.D.C. 46, 293 F. 1013 (1923), is much criticized, has never been adopted in Maryland, and I am opposed to its adoption. (2) The decision here is out of step with that of a number of respected courts as to the basis for admission of evidence concerning expert opinions related to fingerprints, ballistics, X-ray,

and the like. (3) The decision here is out of step with our prior Maryland holdings concerning expert testimony. (4) The majority of reported opinions which have considered the matter have permitted the admission of expert testimony relative to spectrographic analysis and voice identification. (5) Even if the Frye test were made applicable, the evidence here satisfied that test. I shall consider these points seriatim.

1. The Frye test

a. Views of authorities on the subject

Prior to the decision in *Reed v. State*, 35 Md.App. 472, 372 A.2d 243 (1977), Frye had never been cited in Maryland.

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Moreover, I fail to find where its concepts have previously [391 A.2d 378] been enunciated in Maryland. Obviously, it is in no way binding upon us. 1

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It should be noted at the outset that Frye was concerned with a type of situation materially different from that with which we are here faced. The defendant there was convicted of murder in the second degree. His sole assignment of error on appeal was the Refusal 2 of the trial court to permit "an expert witness to testify to the result of a deception test made upon defendant." That test was a precursor of the present day polygraph, and was based solely on systolic blood pressure. The court said:

"(T)he theory seems to be that truth is spontaneous, and comes without conscious effort, while the utterance of a falsehood requires a conscious effort, which is reflected in the blood pressure. The rise thus produced is easily detected and distinguished from the rise produced by mere fear of the examination itself. In the former instance, the pressure rises higher than in the latter, and is more pronounced as the examination proceeds, while in the latter case, if the subject is telling the truth, the pressure registers highest at the beginning of the examination, and gradually diminishes as the examination proceeds." *Id.* at 1014.

Prior to the trial the defendant had been "subjected to this deception test, and counsel offered the scientist who conducted the test as an expert to testify to the results obtained." Apparently, it was intended to have the expert state that the defendant was telling the truth. It was in this context that the court said it thought "the systolic blood pressure deception test ha(d) not yet gained such standing and scientific recognition among physiological and psychological authorities as would justify the [391 A.2d 379] courts in admitting expert testimony deduced from the discovery, development and experiments thus far made."

The evidence proposed in Frye was an obvious invasion of the province of the jury since the trier of fact is vested with

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the responsibility of determining the credibility of witnesses. It should be instantly perceived that the controversy here concerns a type of evidence vastly different from that rejected in Frye.

The Frye standard for determining admissibility of scientific evidence has been criticized by a number of respected scholars. Some object to the test generally. Others point to its inapplicability in the type of case at bar. Dean McCormick probably succeeded Professor Wigmore as the foremost authority in the field of evidence. McCormick's Handbook of the Law of Evidence § 203 at 489 (2d ed. 1972) states, "So far as it can be dated, the notion of a special rule of admissibility for scientific evidence seems to have arisen in 1923," referring to Frye. After pointing out that "(n)o authority was cited" for the court's conclusion in Frye, the authors state:

" '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. Particularly, probative value may be overborne by the familiar dangers of prejudicing or misleading the jury, and undue consumption of time. If the courts used this approach, instead of repeating a supposed requirement of 'general acceptance' not elsewhere imposed, they would arrive at a practical way of utilizing the results of scientific advances." 3 *Id.* at 491 (footnotes omitted).

J. Richardson, *Modern Scientific Evidence* § 2.5 (2d ed. 1974) states:

"It has been urged that certain scientific tests, as the lie detector, should be barred because they are not infallible. Surely this represents a type of judicial

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prejudice, for infallibility has never been a test for the admissibility of evidence scientific or otherwise. Universal acceptance can be ruled out for the same reason, and it is urged that general scientific acceptance is a proper condition for the court to take judicial notice of a scientific fact, without laying the usual foundation, but not a sound criterion for the admissibility of scientific evidence. Any relevant conclusions, which are supported by a qualified expert witness, in a field finding substantial scientific acceptance should be admitted in evidence, for its probative value to be weighed by competent fact-finders in the light of all the circumstances. The courts should not confuse novelty with want of acceptance in refusing to admit the results of scientific techniques which offer much in aiding to ascertain the truth." *Id.* at 24 (footnote omitted).

The same author in § 9.2 quotes Frye in a footnote and then states:

"Here the court lays down the test of General acceptance, which, though ill-defined, is too restrictive. Actually, the degree of scientific acceptance should go to probative value, not admissibility. Wigmore once wrote, 'All that should be required as a condition (to admissibility) is the preliminary testimony of a scientist that the proposed test is an accepted one in his profession and that it has a reasonable measure of precision in its indications.' Evidence, § 990 (2d ed. 1923)." *Id.* at 290 n. 8 (emphasis in original).

A statement by Professor Wigmore identical to that quoted by Professor Richardson is found in J. Wigmore, Evidence § 990 at 626 (3d ed. 1940). The reference in Wigmore is to psychological testing.

A. Moenssens, R. Moses & F. Inbau, Scientific Evidence in Criminal Cases § 12.06 at [391 A.2d 380] 517 n. 9 (1973), in discussing voice

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identification by spectrograms, states, "It is debatable, of course, whether the 'general acceptance' test of Frye . . . which has for decades been used by courts in determining admissibility of novel scientific test results, is a proper prerequisite to admissibility." The authors then quote from McCormick, Evidence § 170 (1954), to the effect that general scientific acceptance "is a proper condition upon the court's taking judicial notice of scientific fact, but not a criterion for the admissibility of scientific evidence."

Professor Strong of the University of Oregon said in Questions Affecting the Admissibility of Scientific Evidence, 1970 U.Ill.L.F. 1 (1970):

"In addition to the requirement that the expert tendered be qualified to supply or apply the scientific principle or principles, there exists another requirement under which the testimony of persons professing acquaintance with principles unknown to the tribunal may be rejected. This requirement, which was first announced in *Frye v. United States*, is that the principle upon which the expert proposes to testify must have achieved general acceptance in the scientific community. However, unanimity of approval, manifestly impossible in a world still believed by some to be flat, is not required. The resulting standard, something greater than acceptance by the expert himself but less than acceptance by all experts in the field, is obviously somewhat lacking in definiteness. Some courts have seemingly rejected the Frye standard, and others have tailored it to fit unusual situations. Nevertheless, the rule continues to be widely accepted.

"In addition to the difficulties apparent in ascertaining whether a general proposition of science has or has not been generally accepted, the Frye standard has been criticized as overly rigorous and as introducing an element of inconsistency into the law of evidence." *Id.* at 10-11 (footnotes omitted).

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Additional criticism of the Frye test is found in Decker & Handler, Voiceprint Identification Evidence Out of the Frye Pan and Into Admissibility, 26 Am.U.L.Rev. 314 (1977). Specifically, it is stated:

"The judicial trend denying admissibility of voiceprint identification evidence was based on a literal interpretation of the Frye Standard of general scientific acceptance. Since the standard was drawn from dicta and formulated more than fifty years prior to advancements in science and technology such as spectrographic identification analysis, it is necessary that its validity be re-examined.

"The standard enunciated in *Frye* is one that is 'neither common to criminal litigation nor easily applied in the individual case.' Since its inception, the Frye standard has been the subject of criticism because of the limiting effect it has had on judicial acceptance of new methods of scientific investigation. In light of the rationale behind the Frye rule and its practical application to voiceprint identification evidence cases, it is apparent that the criticism is quite warranted.

"One of the reasons for the rule was to prevent the development of arbitrary decisions on issues of admissibility. Yet, enunciation of the Frye standard, without any definitive criteria as to who and how large the pertinent scientific community must be, has unnecessarily limited the discretion a trial court should have in utilizing relevant input. Indeed, while the Frye standard was utilized in *State v. Cary* and *People v. King*, it was not until *United States v.*

Addison That one could find a comprehensive discussion of general scientific acceptance and how it ought to operate in the spectrographic analysis setting." Id. at 361-62 (footnotes omitted).

The authors further comment relative to Frye :

"Proponents of logical relevancy have criticized the Frye test, and suggested that there would be greater

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unanimity in the treatment of all forms of scientific evidence if the Frye rule were modified in conformance with the doctrine of logical relevance. That is, scientific evidence [391 A.2d 381] could be submitted to the jury upon a showing of reasonable reliability. Based on its determination of the accuracy and reliability of the evidence, the jury would decide the weight to be accorded it. Boyce, *Judicial Recognition of Scientific Evidence in Criminal Cases*, 8 *Utah L.Rev.* 313, 325-26 (1963-64); Note, *Evolving Methods of Scientific Proof*, 13 *N.Y.L.F.* 67(9), 681-85 (1968)." Id. at 362 n.304.

Gorecki, Comment: *Evidentiary Use of the Voice Spectrograph in Criminal Proceedings*, 77 *Mil.L.Rev.* 167, 169 (1977), notes, "Criticism has been leveled at the rigidity of the Frye scientific standard both generally and with respect to its application to the voice spectrograph technique," citing, in addition to Professor Strong's article which we have heretofore quoted, Note, *The Voiceprint Technique: A Problem in Scientific Evidence*, 18 *Wayne L.Rev.* 1365, 1383 (1972), and Note, *Evolving Methods of Scientific Proof*, 13 *N.Y.L.F.* 679 (1968). Major Gorecki does not list the pages where the criticism is found in the latter publication, but they are 683, 684-85, 747 and 749.

It is suggested by Boyce, *Judicial Recognition of Scientific Evidence in Criminal Cases*, 8 *Utah L.Rev.* 313 (1963-64):

"There seems to be little reason why courts should not allow juries to hear both sides of the question of the reliability of a particular form of scientific evidence and decide what, if any, weight it should be accorded, upon, of course, a foundation which shows there is a reasonable possibility of reliability." Id. at 325-26.

Some are of the view that the new Federal Rules of Evidence 702 and 703, governing expert testimony, have adopted the McCormick standard of "assisting the trier of fact" rather than the Frye requirement of "general scientific acceptance." Romero, *The Admissibility of Scientific*

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Evidence Under the New Mexico and Federal Rules of Evidence, 6 *N.M.L.Rev.* 187, 197 (1976); Comment, *Expert Testimony and Voice Spectrogram Analysis*, 1975 *Wash.U.L.Q.* 775, 782 n.27 (1975); and Comment, *Evidence-Admission of Voiceprints Does Not Exceed the Discretion of the Trial Judge United States v. Franks*, 511 *F.2d* 25 (1975), 44 *Cinn.L.Rev.* 616, 621 (1975). Without discussing Frye, J. Weinstein and M. Berger, *Weinstein's Evidence* (1976), states:

"Doubts about whether an expert's testimony will be useful should generally be resolved in favor of admissibility unless there are strong factors such as time or surprise favoring exclusions. The jury is intelligent enough, aided by counsel, to ignore what is unhelpful in its deliberations." Id. at 702-9.

New Federal Rule 901 provides in pertinent part:

"(a) General provision. The requirement of authentication or identification as a condition precedent to admissibility is satisfied by evidence sufficient to support a finding that the matter in question is what its proponent claims.

"(b) Illustrations. By way of illustration only, and not by way of limitation, the following are examples of authentication or identification conforming with the requirements of this rule:

"(3) Comparison by trier or expert witness. Comparison by the trier of fact or by expert witnesses with specimens which have been authenticated.

"(5) Voice identification. Identification of a voice, whether heard firsthand or through mechanical or electronic transmission or recording, by opinion based upon hearing the voice at any time under circumstances connecting it with the alleged speaker."

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Weinstein and Berger, *Supra*, comment:

"Rule 901(b)(5) provides for the identification of any voice by any person who can connect the voice with the alleged speaker by 'hearing' the voice. This language does not preclude testimony by an expert witness who has not 'heard' the voice but who has identified it by the voiceprint technique. Cf. Rule 901(b)(3), (4)." Weinstein's *Evidence* at 901-61.

[391 A.2d 382] It is of interest that these authors, after discussion of Lawrence Kersta and his early experiments in the field here under discussion, state with reference to this technique at 901-69, "At this stage of development, given an adequate expert's testimony, admissibility is warranted."

b. The majority opinion on this subject

The majority opinion cites 28 cases in support of its proposition that the "criterion of 'general acceptance' in the scientific community has come to be the standard in almost all of the courts in the country which have considered the question of the admissibility of scientific evidence." They state the proposition too broadly. For instance, in *People v. Busch*, 56 Cal.2d 868, 16 Cal.Rptr. 898, 366 P.2d 314 (1961), no mention is made of Frye or its criteria. In that case a defendant sought to have a physician testify relative to his use of hypnosis as an analytical tool in his determination of the mental condition of the defendant at the time of the killings in question. The Supreme Court of California pointed out that "(t)he objections were made and sustained on the stated grounds that hypnosis is not a sufficiently scientific means of exploring the state of mind, that the witness was not qualified in this field, and that the opinions were formulated on the defendant's statements and constituted hearsay." The court said that "the witness conceded that this was his initial appearance in the role of an expert in a criminal case on the subject matter of an accused's state of mind; that he was not a psychiatrist and had engaged in the practice of medicine as a general practitioner until shortly before his

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appearance in the case (then) at bar as an expert specializing in hypnosis." The court further stated:

"In laying a foundation for the introduction of opinion evidence of the state of mind of a defendant based upon the use of a technique not theretofore recognized by the courts as sufficiently reliable to form the basis for such an opinion, at the very least, some showing of its successful use in the examination of others than the defendant for the same purpose, either by the witness or by other experts in the field, would appear to be required. We are persuaded that under the circumstances herein narrated the trial judge did not act unreasonably in his determination that a proper foundation was not established as to the reliability of an analytical tool still seeking recognition in the field of psychiatry, or as to the qualifications of this particular witness to give an opinion on the state of mind of the accused on the occasion of the commission of the homicides herein. It must be remembered, ' * * * the general rule is that the trial court, in passing upon the qualification of a witness offered as an expert, has wide discretion, and an appellate court will not disturb its ruling in the absence of a manifest abuse of such discretion.' (*People v. Chambers*, 162 Cal.App.2d 215, 220, 328 P.2d 236, 239; see also *People v. Goldsworthy*, 130 Cal. 600, 604-605, 62 P. 1074.) In the instant case no abuse of discretion is demonstrated and the trial judge justifiably sustained the objections presented by the record in this case to the admission of the offered opinion testimony based on the use of hypnosis." 16 Cal.Rptr. at 903-04, 366 P.2d at 319.

In *State v. Arnwine*, 67 N.J.Super. 483, 171 A.2d 124 (App.Div.1961), the issue before the court was whether a defendant who had voluntarily submitted to a polygraph test but who did not consent to the admission of its results was prejudiced by testimony of a detective who gave the test,

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which testimony indirectly showed the result of the test. The court pointed out, "The record of the trial below is barren of any effort to lay a foundation with respect to the equipment used or to establish the technical qualifications of Detective John Latawicz, the polygraphic examiner, other than the fact that he was a sergeant associated, as such an examiner, with the New Jersey State Police." *Id.* at 487, 171 A.2d at 126. It noted the ironic fact that Frye, the defendant in *Frye v. United States*, 54 App.D.C. 46, 293 F. 1013 (1923), "was sentenced to life imprisonment. The blood[391 A.2d 383] -pressure deception test indicated his innocence, and this was subsequently corroborated when a third person confessed that he was the real murderer. Had the results of the test been admissible evidence, it is altogether probable that an innocent man would not have been convicted of murder," citing authorities. *Id.* at 493, 171 A.2d at 130. Judge Foley in his concurring opinion, 67 N.J.Super. 499, 171 A.2d 133, said that "because the issue of the admissibility of such results was not before (the court, he was) unwilling to spell out generally, and for future guidance, the foundation of proof required to make the test results evidential," adding that it seemed to him "that this should await a case in which the issue (was) squarely raised so that the decision therein m(ight) be construed in light of a live, rather than a hypothetical, factual complex." He further said:

"It is my view that Dicta are to be avoided as far as possible and should be employed only where they serve to illuminate the holding in a case. I think that this is particularly true when the Dicta involve a discussion of the present status of scientific information as it affects the law. The pace of research in science is so swift, and the impulse of those engaged in this field is so dynamic that the artisans of the law would be well advised to avoid fixing standards unnecessarily, which in future application may be found to be based on scientific concepts which are then outmoded. Compare, *E. g.*, *State v. Hunter*, 4 N.J.Super. 531, 538, 68 A.2d 274 (App.Div.1949), with *State v. Miller*, 64 N.J.Super. 262, 269-270, 165 A.2d 829 (App.Div.1960)." *Id.* at 499, 171 A.2d at 133.

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In *State v. Swanson*, 225 N.W.2d 283 (N.D.1974), another of the cases cited in the majority opinion, a defendant sought to introduce evidence of his willingness to take a polygraph test. The trial court refused to accept such evidence. The court said it was urged to overrule its decision in the case of *State v. Pusch*, 77 N.D. 860, 46 N.W.2d 508 (1951), and to accept the results of polygraph testing in criminal proceedings. After stating that "(t)here ha(d) been some evidence of a breach in the wall of judicial opposition to utilizing this device," citing several cases, the court said:

"This court may be required to re-examine its decision in *State v. Pusch*, supra, if presented with an appropriate record. Such a record is not present in this case. There was no actual test made of this defendant, he merely offered to take such a test. There was little evidence offered concerning the scientific reliability and acceptance of the polygraph or the qualifications of its proposed operator. The testimony of the officer called to explain the proposed test indicated that the polygraph would be inconclusive in a case of this type." Id. at 285.

In *Romero v. State*, 493 S.W.2d 206 (Tex.Cr.App.1973), another of the cases cited in the majority opinion, *Frye* is simply one of the cases mentioned as having considered the polygraph. The court noted that in *Frye* it "really (was) a monograph rather than a polygraph . . ." No standard was set forth. The court said that it had previously "followed the almost unanimous view of American courts concerning the admissibility of the results of a polygraph test." Id. at 210. It asserted that it was "convinced at th(at) time that (it) should adhere to the general rule of exclusion." Id. at 211.

The issue before the court in *State v. Woo*, 84 Wash.2d 472, 527 P.2d 271 (1974), yet another case cited in the majority opinion, was whether the results of a polygraph examination of a criminal defendant were admissible in evidence upon a stipulation of the defendant alone. The court said, "The general rule, followed almost without exception since *Frye v. United States*, 54 App.D.C. 46, 293 F. 1013 (1923), is that the results

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of a polygraph examination are inadmissible at trial." Nothing was said about applicable standards. The court noted that in a perjury case, *United States v. Ridling*, 350 F.Supp. 90 (E.D.Mich.1972), the court, citing *C. McCormick*, *Law of Evidence* 505 (2d ed. E. Cleary 1972), "viewed the expert testimony on polygraph results as opinion rather than scientific evidence," [391 A.2d 384] admitting the evidence when it "concluded that 'the state of the science is such that the opinions of experts "will assist the trier of fact to understand the evidence. " ' " The court further said:

"Turning again to the cases before us, the records of the omnibus hearings, unlike that in either *Ridling* or *Zeiger*, are devoid of any material to support the decisions of the judge. There is nothing to disclose whether there exists even minimum accepted qualifications for polygraph operators. If standards do exist, one is left to speculate as to what they are. There is nothing in the records, by way of testimony or exhibit, concerning the trustworthiness of the most modern polygraph equipment. The type of equipment proposed to be used in the instant cases and its reliability are not disclosed. Further, the records are silent as to techniques to be used in the examinations and whether they are professionally acceptable.

"If we are to consider a departure from a virtually unanimous rule against the admissibility of polygraph examinations, absent stipulation, we must be furnished with a record sufficiently adequate to permit review of the subject." Id. at 474-75, 527 P.2d at 273.

It is of interest that 16 of the 28 cases cited by the majority for its proposition are concerned with the admission of polygraph evidence. Two additional cases, *State v. Smith*, 50 Ohio App.2d 183, 362 N.E.2d 1239 (1976), and *Henderson v. State*, 94 Okl.Cr. 45, 230 P.2d 495 (1951), are concerned with polygraph plus another test gunshot residue in *Smith* and truth serum in *Henderson*.

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Certain of the cases cited by the majority point to inherent weaknesses in the polygraph technique, weaknesses not involved in the case at bar. For instance, in *Henderson* the court said that it could "foresee conditions where to ascertain the truth, it would become necessary to require the operator of the machine to submit to a test to determine the truthfulness of his interpretations." Id. at 53, 230 P.2d at 503.

In *State v. Steele*, 27 N.C.App. 496, 500, 219 S.E.2d 540, 544 (1975), another of the cases cited by the majority, the court pointed out, quoting 46 Iowa L.Rev. (1961) relative to polygraphs, that "'(r)eliability depends greatly on the skill and experience of the expert' " and "'(a) much greater degree of interpretation is involved than in blood and ballistics tests.' " In the type of test in the case at bar the jury Hears the recording of the voice known to be that of the defendant And the recording Said by the expert to be the voice of the defendant. It also Sees the spectrographic samples.

In *Boeche v. State*, 151 Neb. 368, 37 N.W.2d 593 (1949), another of the polygraph cases cited by the majority opinion, the court said concerning the refusal of the trial court to reopen the case so the defendant could submit to an examination by polygraph:

"Cogent reasons in support of this attitude readily suggest themselves. In the first place, the vital function of cross-examination would be impaired. The operator, appearing as a witness to report and interpret the results of the test, might be questioned as to his qualifications, experience, his methods, and on similar matters, and that is about all. But the machine itself conceding the comparatively high percentage record as to accuracy and reliability claimed for it escapes all cross-examination. There is no persuasive analogy here with such tests as fingerprinting which have a strictly physical basis, clearly demonstrable. It is not contended that the lie detector measures or weighs the important psychological factors. Many innocent but highly sensitive persons would undoubtedly show unfavorable

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physical reactions, while many guilty persons, of hardened or less sensitive spirit, would register no physical indication of falsification. This the trained operators of course understand, and proceed upon the basis of a large percentage of error. But it seems quite too subtle a task of evaluation to impose upon an untrained jury." *Id.* at 377, 37 N.W.2d at 597.

[391 A.2d 385] In *State v. Valdez*, 91 Ariz. 274, 371 P.2d 894 (1962), another of the polygraph cases cited by the majority, the court pointed out shortcomings of the polygraph technique:

"(I)n addition to the above enumerated scientific shortcomings of the polygraph technique the following objections to the unrestricted use of its results in the court room have been registered:

"(1) The supposed tendency of judges and juries to treat lie-detector evidence as conclusive on the issue of defendants' guilt. See Highleyman, *The Deceptive Certainty Of The 'Lie Detector'*, 10 *Hastings L.Rev.* 47 (1958); Kleinfeld, *The Detection of Deception A Resume*, 8 *Fed.B.J.* 153 (1947).

"(2) Lack of standardization of test procedure, (Burack, *A Critical Analysis Of The Theory, Method, And Limitations Of The 'Lie Detector'*, 46 *J.Crim.L., C. & P. S.*, 414 (1955); Koffler, *The Lie Detector A Critical Appraisal Of The Technique As A Potential Undermining Factor In The Judicial Process*, 3 *N.Y.L.F.* 123 (1957)), examiner qualifications and instrumentation.

"(3) Difficulty for jury evaluation of examiners' opinions." *Id.* at 279-80, 371 P.2d at 898 (footnote omitted).

2. Rules used in admissibility of fingerprints, ballistics, etc.

The general rule concerning the admissibility of evidence is summarized as follows in Kaplan, *The Lie Detector: An*

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Analysis of Its Place in the Law of Evidence, 10 *Wayne L.Rev.* 381 (1964): 4

"The General Standard for Admissibility. Since the purpose of a trial is to discover the facts involved in a transaction or occurrence and to decide the issues presented in accordance with such facts, the general standard used in determining whether evidence should be admitted is that 'all facts having rational probative value are admissible unless some specific rule forbids.' The probative value of a piece of evidence concerns its relationship to an issue to be decided in the lawsuit. If the evidence furthers, to some extent, the progress toward establishing the issue in question, it is considered admissible subject to the existence of policy factors weighing against its admission. The policy factors include such possibilities as misleading the jury or unduly prejudicing one party's position in the opinion of the jury. In considering such policy factors, the courts are weighing the prejudicial effect of admitting the evidence against the harm of excluding relevant evidence. Generally, the decision as to the wisdom of admitting or refusing the evidence is made according to the discretion of the trial judge." *Id.* at 393 (footnotes omitted).

Evidence which purports to be of a "scientific" character has been scrutinized carefully to insure that the evidence is sufficiently reliable to have some logical relevance to a material issue in the case. However, as will be seen from a review of cases considering other scientific developments of this century, scientific evidence has generally been admitted if supported by the testimony of a qualified expert. Although the lie detector cases have emphasized a need for "general acceptance in the particular field in which (the scientific principle) belongs," *Frye*, 54 *App.D.C.* at 47, 293 F. at 1014, the focus in other cases considering some new development has been on

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reasonable reliability, not general acceptance. 5 In an early study of scientific evidence, Inbau, *Scientific Evidence in Criminal Cases (I)*, 24 *J.Crim.L. & C.* 825 (1934), stated:

[391 A.2d 386] "Regardless of the justification for excluding evidence of a scientific nature, a court may assume either of two different attitudes one open-minded and perhaps hopeful of the possibilities of the particular science in

question; the other somewhat bigoted and scornfully expressive of the utter hopelessness of scientific aid concerning the problem before the court. Throughout the numerous decisions upon the admissibility of scientific evidence there are many illustrations of both points of view." *Id.* at 826 (footnote omitted).

I shall not attempt to characterize the varying views accorded the testimony as to identification of voices by spectrographic analysis.

a. Fingerprints

Some critics of the spectrographic voice identification process have suggested that any new scientific technique should be shown to be as reliable as fingerprinting before a jury is allowed to consider such evidence. Today we accept as commonplace travel at speeds such that one may cross the continent in less than the time that it took even as late as the end of World War II to travel by automobile from Baltimore to New York City. There are even members of this Court, however, who can remember the time when it was equally commonplace for many farmers to come to town on Saturday night by horse and carriage, hitching their horses to conveniently placed hitching posts. A relatively short time

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ago those who traveled by motor vehicle were able to cross the Chesapeake Bay only by boat. Many persons today have forgotten the travel methods of even a few years back. Fingerprinting has long been recognized as an extremely reliable method of identification. Just as we may be prone to forget changes in the field of transportation, we may forget that even this branch of forensic science had its infancy. "Fingerprinting came into widespread use in this country from about 1910 on, after some isolated experiments on a local level, beginning in 1902." A Moenssens, et al., *Supra*, 308. The process was admitted into evidence almost immediately. See generally Inbau, *Scientific Evidence in Criminal Cases* (III), 25 *J.Crim.L. & C.* 500 (1934).

Moenssens and Inbau indicate that the first appellate decision in this country considering fingerprint evidence was *People v. Jennings*, 252 Ill. 534, 96 N.E. 1077 (1911). Jennings was accused of murder at one home in connection with a series of nighttime intrusions into the bedrooms of women. The porch railing at the home where the murder took place had been painted a short time previously. Investigators discovered the imprint on the railing of four fingers of someone's left hand. Four witnesses testified that in their opinion the prints on the railing and the prints taken from the fingers of Jennings by the identification bureau were made by the same person. As the court put it, Jennings "earnestly insisted . . . that this class of testimony is not admissible under the common law rules of evidence" After taking note of the widespread use of fingerprints by police, although noting, "No case in which this question has been raised has been cited in the briefs and we find no statutes or decisions touching the point in this country," the court applied the general rule "that whatever tends to prove any material fact is relevant and competent," stating:

"We are disposed to hold from the evidence of the four witnesses who testified, and from the writings we have referred to on this subject, that there is a scientific basis for the system of finger-print identification and that the courts are justified in

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admitting this class of evidence; that this method of identification is in such general and common use that the courts cannot refuse to take judicial cognizance of it. Such evidence may or may not be of independent strength, but it is admissible, the same as other proof, as tending to make out a case. If inferences as to the identity of persons based on the voice, the appearance or age are admissible, why does not this record justify the admission of this finger-print testimony under common law rules of evidence? [391 A.2d 387] The general rule is, that whatever tends to prove any material fact is relevant and competent." *Id.* at 549, 96 N.E. at 1082.

The process was next approved in *State v. Cerciello*, 86 N.J.L. 309, 90 A. 1112 (1914). The defendant there vigorously objected to introduction into evidence of his fingerprints for the purpose of comparing them with prints found upon the hatchet which was the murder weapon. The court said that this question "present(ed) a subject for judicial consideration, which while not entirely *Res nova* in principle, is in its practical application in criminal procedure in (New Jersey at that time) essentially novel." *Id.* at 313, 90 A. at 1114. It then held:

"In principle its admission as legal evidence is based upon the theory that the evolution in practical affairs of life, whereby the progressive and scientific tendencies of the age are manifest in every other department of human endeavor, cannot be ignored in legal procedure, but that the law in its efforts to enforce justice by demonstrating a fact in issue, will allow evidence of those scientific processes, which are the work of educated and skillful men in their various departments and apply them to the demonstration of a fact, leaving the weight and effect to be given to the effort and its results entirely to the consideration of the jury. *Steph. Dig. Ev.* 267; 2 *Best Ev.* 514." *Id.* at 314, 90 A. at 1114.

The Court of Appeals of New York approved the admissibility of fingerprint evidence in *People v. Roach*, 215

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N.Y. 592, 109 N.E. 618 (1915). The court said that it was "earnestly insisted that the admission in evidence of the testimony of an alleged expert as to finger-print impressions was error and of such a material character as to have wrought grave injury to the defendant and to necessitate the reversal of this judgment." Judge Samuel Seabury said for the court:

"Before testifying to his opinion as to the identity of the defendant's finger prints with the marks upon the board the witness explained fully his qualifications, specified the circumstances upon which he predicated his opinion and swore that he was able to express an opinion with reasonable certainty. He was exhaustively and skillfully cross-examined as to every detail of his testimony. Ample basis was afforded for the jury to come to an intelligent conclusion as to the correctness of the opinion which he expressed. In view of the progress that has been made by scientific students and those charged with the detection of crime in the police departments of the larger cities of the world, in effecting identification by means of finger-print impressions, we cannot rule as a matter of law that such evidence is incompetent. Nor does the fact that it presents to the court novel questions preclude its admission upon common-law principles. The same thing was true of typewriting, photography and X-ray photographs, and yet the reception of such evidence is a common occurrence in our courts. The evidence to prove identity often presents doubtful and unsatisfactory features. One man may be mistaken for another because they look alike, or identity of person may be inferred from similarity of features, height, expression or a variety of other circumstances. Under common-law principles whatever tends to prove any material fact is relevant and competent." *Id.* at 604, 109 N.E. at 623.

The New York court made it clear that the possibility of error

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in the process affected only the weight of the evidence, not its admissibility:

"The fact that error may sometimes result in effecting identification, by this means affords no reason for the exclusion of such evidence. Mistakes may also occur in effecting identification by personal appearance, casual meeting, by handwriting or by one's voice heard in the dark or over the telephone, but evidence of this character is admissible and its weight is to be determined by the jury. Courts have often allowed proof of circumstances apparently very trivial as evidence upon which identification might be effected. (*State v. Rainsbarger*, 74 Iowa 196, 37 N.W. 153; *Wilbur v. Hubbard*, 35 [391 A.2d 388] Barb. 303.) The evidence of the expert as to the identity of the finger prints of the defendant, with the blood marks found upon the clapboards of the house, was a proper subject for the consideration of the jury. The weight to be given to this evidence was for the jury, not the court, to determine. Certainly the reception of this evidence would not justify the reversal of this judgment." *Id.* at 605, 109 N.E. at 623.

As *Roach* illustrates, the early cases concerning fingerprints admitted such evidence under the general rule which Wigmore described as "(t)he second (of the two) axiom(s) on which our law of Evidence rests": "All facts having rational probative value are admissible unless some specific rule forbids." 1 J. Wigmore, *Evidence* § 10 at 293 (3d ed. 1940) (emphasis in original). In this regard he says:

"In this respect the century of the 1800s witnessed a gradual but marked improvement in the practical enforcement of this principle. 'People were formerly frightened out of their wits,' said Chief Justice Cockburn, in 1861, 'about admitting evidence, lest juries should go wrong. In modern times we admit the evidence and discuss its weight.'" *Id.* at 295 (footnote omitted).

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By the time the fingerprint issue reached this Court in *Murphy v. State*, 184 Md. 70, 85-86, 40 A.2d 239, 246 (1944), Judge Bailey said, "(T)his Court must take judicial notice of the fact that the use of fingerprints is an infallible means of identification." 6 As *Cerciello* and *Roach* demonstrate, however, scientific evidence need not be so indisputable as to merit judicial notice before it warrants admissibility. 7

b. Ballistics

Although the accuracy of firearms identification is common knowledge today, See *Moenssens et al.*, *Supra*, § 4.16 at 149, the Illinois Supreme Court at one point labeled the claims of ballistics experts as "preposterous." *People v. Berkman*, 307 Ill. 492, 501, 139 N.E. 91, 94 (1923). 8 See generally [391 A.2d 389] *Inbau*,

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Scientific Evidence in criminal Cases (I), 24 J.Crim.L. & C. 825 (1934). Professor *Inbau* notes: "A Virginia case decided in 1879, *Dean v. Commonwealth*, (32 Gratt. (Va.) 912 (1879),) is the first in which an appellate court

approved of testimony regarding the similarity between fatal and test bullets although weight, rather than any characteristic markings, constituted the basis for comparison." *Id.* at 830. "The first semblance of firearms identification evidence as we know it today, was presented in the 1902 Massachusetts case of *Commonwealth v. Best* (, 180 Mass. 492, 62 N.E. 748 (1902))." *Moenssens Et al.*, *supra*, § 4.16 at 147. The writer of the opinion in *Best* was Oliver Wendell Holmes, then Chief Justice of the Supreme Judicial Court of Massachusetts. He there said for the court:

"The government contended that Bailey was shot with a Winchester rifle that was in the kitchen. Two bullets were found in his body, and the government was allowed to prove that another bullet of the same calibre had been pushed through the rifle on or shortly after October 24. It then was allowed to put this bullet in evidence, and also photographs from this and the two bullets from the body, in order to show that the marks from the rifle in the two cases coincided so closely as to prove that all three bullets had passed through the same rifle barrel. This evidence was excepted to. The main ground seems to be that the conditions of the experiment did not correspond accurately with those of the date of the shooting, that the forces impelling the different bullets were different in kind, that the rifle barrel

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might be supposed to have rusted more in the little more than a fortnight that had intervened, and that it was fired three times on October 10, which would have increased the leading of the barrel. We see no other way in which the jury could have learned so intelligently how that gun barrel would have marked a lead bullet fired through it, a question of much importance to the case. Not only was it the best evidence attainable but the sources of error suggested were trifling. The photographs avowedly were arranged to bring out the likeness in the marking of the different bullets and were objected to on this further ground. But the jury could correct them by inspection of the originals, if there were other aspects more favorable to the defence." *Id.* at 495-96, 62 N.E. at 750.

Prof. Inbau notes that "*State v. Clark*, (99 Or. 629, 196 P. 360 (1921)), appears to be the first one approving of identification by means of markings upon fatal and test Shells." 24 *J.Crim.L. & C.* at 833 (emphasis in original). In *Clark* the court said:

"The admission of testimony concerning tests of this character rests very largely within the sound discretion of the court. *State v. Holbrook*, 98 Or. 43, 188 P. 947. That discretion was properly exercised in the case at bar. The tendency of this testimony was to prove that the cartridge that was found near the boulder was from the defendant's gun." 99 Or. at 665, 196 P. at 372.

In *State v. Vuckovich*, 61 Mont. 480, 203 P. 491 (1921), decided the same year as *Clark*, the court found no difficulty in approving the admission of expert testimony identifying the defendant's gun as the murder weapon. Having fired a test bullet from the defendant's gun, the experts testified that the shell "showed the same peculiar crimp or mark as that appearing on the shell found at the scene of the homicide," and that "(t)he rifling marks made by the lands

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and grooves in the barrel of the pistol were the same." The court said:

"It seems to be a well-established rule that it is largely within the discretion of the trial court to permit experiments to be made, and that caution should be exercised in receiving such evidence. It should be admitted only where it is obvious to the court from the nature of the experiments that the jury will be enlightened, rather than confused. Such evidence should not be excluded merely because it is not necessary in establishing the facts sought to be shown by the prosecution, if it tends to corroborate the [391 A.2d 390] position taken by the expert witness whose evidence has been received; for whenever the opinion of a person is admitted to be relevant the grounds on which it is based are also relevant." *Id.* at 494, 203 P. at 495.

As we have already indicated, the Supreme Court of Illinois initially was not favorably disposed toward reception of ballistics testimony. In *Berkman*, 307 Ill. 492, 139 N.E. 91 (1923), a police officer who purported to be an expert on firearms maintained that he could state positively that a given bullet had been fired by a given gun. That court scoffed at this "remarkable evidence," stating:

"(The officer) gave it as his opinion that the bullet introduced in evidence was fired from the Colt automatic revolver in evidence. He even stated positively that he knew that that bullet came out of the barrel of that revolver, because the rifling marks on the bullet fitted into the rifling of the revolver in question, and that the markings on that particular bullet were peculiar, because they came clear up on the steel of the bullet. There is no evidence in the case by which this officer claims to be an expert that shows that he knew anything about how Colt automatic revolvers are made and how they are rifled. There is no testimony in the record showing that the revolver in question was rifled in a manner

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different from all others of its model, and we feel very sure that no such evidence could be produced. The evidence of this officer is clearly absurd, besides not being based upon any known rule that would make it admissible. If the real facts were brought out, it would undoubtedly show that all Colt revolvers of the same model and of the same caliber are rifled precisely in the same manner, and the statement that one can know that a certain bullet was fired out of a 32-caliber revolver, when there are hundreds and perhaps thousands of others rifled in precisely the same manner and of precisely the same character, is preposterous." *Id.* at 500-01, 9 139 N.E. at 94.

Prof. Inbau refers to *Evans v. Commonwealth*, 230 Ky. 411, 19 S.W.2d 1091 (1929), as "the first exhaustive opinion treating firearms identification as a science while sanctioning its use for the purpose of establishing the guilt of an accused individual." 24 J.Crim.L. & C. at 837. The Kentucky court noted at 415, 19 S.W.2d 1091 that the "storm center" of the appeal was the testimony and evidence presented by the ballistics expert, Colonel (then Major) Calvin Goddard. 10 Although Goddard's

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testimony was highly technical in nature, the court [391 A.2d 391] made no reference to any requirement of scientific acceptance. Rather, the standard used appeared to be that applied to expert testimony generally. The court said at 427, 19 S.W.2d at 1098: "The defendant says the evidence of Goddard was highly technical, unreasonable, extremely doubtful, and therefore inadmissible, but the same could just as plausibly be said of evidence of finger prints, and that is admitted every day."

In *People v. Fisher*, 340 Ill. 216, 172 N.E. 743 (1930), the court, which but seven years before had referred to the science of firearms identification as "preposterous," ruled such testimony admissible on the same grounds as any other expert testimony, relying on *People v. Jennings*, *supra*, the first fingerprint case. The court said:

"It is argued that this testimony was novel and should not have been admitted; that it was not within the field of expert testimony; that such evidence is not admissible under the common law and no statute of this State authorizes its admission. The same objection was raised in *People v. Jennings*, 252 Ill. 534, 96 N.E. 1077, to the admission of finger prints as means of identification. So the same question was raised when photography was first introduced. (1 Wigmore on Evidence, sec. 795.) Of such evidence it was said in *People v. Jennings*, *supra*, that while it may or may not be of independent strength, it is admissible, the same as other proof, as tending to make out a case. The general rule is that whatever tends to prove any material fact is relevant and competent. (*People v. Gray*, 251 Ill. 431, 96 N.E. 268.) Expert testimony is admissible when the subject matter of the inquiry is of such a character that only persons of skill and experience in it are capable of forming a correct judgment as to any facts connected therewith. (*People v. Jennings*, *supra*.) Such evidence is not confined to classified and special professions, but is admissible wherever peculiar skill and judgment applied to a particular subject are required to explain results by

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tracing them to their causes. Such evidence is admissible when the witnesses offered as experts have peculiar knowledge or experience not common to the world, which renders their opinions founded on such knowledge and experience an aid to the court or jury determining the issues. (*People v. Jennings*, *supra*; *Yarber v. Chicago and Alton Railway Co.*, 235 Ill. 589, 85 N.E. 928; *Evans v. People*, 12 Mich. 27; *Taylor v. Monroe*, 43 Conn. 36; *Ellingwood v. Bragg*, 52 N.H. 488; *McFaddon v. Murdock*, 1 Ir.Rep. (1867) Cl, 211; 1 *Greenleaf on Evidence*, Lewis' ed. sec. 280.) The question of the qualification of an expert rests largely in the discretion of the trial court. *Bonato v. Peabody Coal Co.*, 248 Ill. 422, 94 N.E. 69; 3 *Wigmore on Evidence*, sec. 1923.

"In *Lyon v. Oliver*, 316 Ill. 292, 147 N.E. 251, it was pointed out that handwriting, photography of questioned documents and identification of typewriting were subjects for expert testimony. It was in that case shown that the same typewriter might, after considerable use, register letters of different form from that which it would make of the same letter when the machine was new, and that whether this has occurred in any given case is a subject for expert testimony. We are of the opinion that in this case, where the witness has been able to testify that by the use of magnifying instruments and by reason of his experience and study he has been able to determine the condition of a certain exhibit, which condition he details to the jury, such evidence, while the jury are not bound to accept his conclusions as true, is competent expert testimony on a subject properly one for expert knowledge." *Id.* at 239-41, 172 N.E. at 753-754.

The same year in which *Fisher* was decided an Ohio appellate court approved the admissibility of ballistics testimony by a banker who made guns his hobby. *Burchett v. State*, 35 Ohio App. 463, 172 N.E. 555 (1930). The court recognized that the science was still in the developmental

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stages, noting, "The possibility of identifying a bullet that has been fired with the [391 A.2d 392] firearm from which it was projected is now receiving intensive study by engineers." 35 Ohio App. at 468, 172 N.E. at 556. The court continued, "The new science, if it be a science, for want of a better name, is known as interior ballistics. Elsewhere Prof. Gunther has said: 'Ballistics now is in the same stage that finger printing was in the days when data on the probability of duplication was being accumulated. And it is fully as promising.' " Id. at 468, 172 N.E. at 556. The court quoted, not the "twilight zone" language of Frye, but rather the more receptive language of the New Jersey fingerprint case, *State v. Cerciello*, 86 N.J.L. 309, 90 A. 1112, to which we have previously alluded, that " 'the law, in its efforts to enforce justice by demonstrating a fact in issue, will allow evidence of those scientific processes which are the work of educated and skillful men in their various departments, and apply them to the demonstration of a fact, leaving the weight and effect to be given to the effort and its results entirely to the consideration of the jury.' " The court said in holding the evidence admissible:

"Without, therefore, assuming to say that a particular fired ball will bear so distinctive a mark upon it, due to the structure of the gun from which it has been fired, as to enable one to identify the gun, we do hold that this is a proper field of evidence, and, it being certainly a field with which the ordinary juror is unfamiliar, the opinion of trained, educated, and skillful men along that line may be received for what it is worth. *Evans v. Commonwealth*, 230 Ky. 411, 19 S.W.2d 1091, 66 A.L.R. 360." Id. at 469-70, 172 N.E. at 557.

By the time our predecessors first ruled upon ballistics evidence in *Edwards v. State*, 198 Md. 132, 81 A.2d 631 (1951), the science was well established. Judge Delaplaine said for the Court there, "For many years ballistics has been a science of great value in ferreting out crimes that otherwise might not be solved. . . . Testimony to identify the weapon from which a shot was fired is admissible where it is shown that the witness offering such testimony is qualified by training

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and experience to give expert opinion on firearms and ammunition." Id. at 142, 81 A.2d at 635. This Court found no error in admitting the opinion of the firearms expert that the bullets had been fired from the gun of the accused, even though the expert said that "it was . . . possible that the bullets could have been fired from a (different gun)." Id. at 144, 81 A.2d at 636.

c. Blood

Moenssens et al., *Supra*, at 288 n. 85 indicate that the first appellate decision on the admissibility of blood grouping evidence was *State v. Damm*, 62 S.D. 123, 252 N.W. 7 (1933), *Aff'd*, 64 S.D. 309, 266 N.W. 667 (1936). By that point in time there was no dispute as to the accuracy of these tests. 11 [391 A.2d 393]

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Writing in 1937, Muehlberger and Inbau stated, "Blood grouping tests have become accepted by the medical profession not only as possessing a 'reasonable measure of precision in their indications' all that the law requires (citing 2 Wigmore, *Evidence* (2d ed. 1923) § 990) but also as producing exact and irrefutable results." *The Scientific and Legal Application of Blood Grouping Tests*, 27 *J.Crim.L. & C.* 578, 586 (1937).

Although the accuracy of these tests was not disputed, there was controversy as to the probative value of such evidence when the tests showed two persons to have the same blood type. Muehlberger and Inbau wrote:

"While logically relevant as concomitant evidence, it seems that the possibility of prejudicial inference against the defendant is too great in return for the remote evidence of capacity. For that reason scientific authorities advocate that the results of blood grouping tests be admitted in evidence only when they conclusively establish a fact, I. e., that the accused could not possibly be the parent. And it was so held in the case of *Flippen v. Meinhold*, on the ground that it would be improper to draw an inference of paternity where merely the possibility is shown. Obviously, the same reasoning would apply in a criminal case." Id. at 592 (footnotes omitted).

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In *Shanks v. State*, 185 Md. 437, 45 A.2d 85 (1945), evidence that the blood type of a rape victim was the same as that of stains on the defendant's coat, *Viz.*, Type O, was admitted by the trial court, in spite of testimony that 45 percent of the population has Type O blood. In his brief in this Court the defendant referred to scientific opinion that blood tests should not be admissible to show possible identification:

"Dr. Flack in his article 'The Forensic Value of Blood Tests in Evidence' discussing the legal significance of these tests says:

"The test, if positive in result, is affirmative proof excluding a possible parent and as such should be admissible. If negative in result the test simply indicates that the party examined could have been the parent and no more. Such an

assertion obviously has no probative value whatsoever since any of the million who fall in the same blood classification could have been the parent as well. Consequently, these negative results must be disregarded and rigidly excluded from evidence as being valueless and prejudicial.'

"Referring to these tests as applied to criminal cases generally, Dr. Flack suggests further

'Evidence of this nature should be used solely for the purposes of exclusion since negative value proves nothing and exclusion constitutes prejudice.' 23 A.B.A.J. 472. " Appellant's brief at 11.

Our predecessors were not persuaded that testimony should not be admissible unless the results were conclusive. Chief Judge Marbury said for the Court, "The objection [391 A.2d 394] of remoteness goes to the weight of the evidence rather than to its admissibility. To exclude evidence merely because it tends to establish a possibility, rather than a probability, would

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produce curious results not heretofore thought of." 185 Md. at 446, 45 A.2d at 89. 12 The Supreme Court of New Jersey reached the same conclusion in *State v. Beard*, 16 N.J. 50, 106 A.2d 265, 268-69 (1954).

A student comment on Shanks conceded that the challenged evidence was logically relevant, but argued that such scientific evidence should have been excluded nonetheless:

"Perhaps, as the court points out, blood groups may now be matters of common knowledge. But it should be remembered that our most noted sociologists agree that scientific knowledge is far in advance of the public awareness of its significance. The very multiplicity of facts that crowd in upon the layman serves to confuse him more. His knowledge, therefore, is as superficial and uncoordinated as it is diversified. He does not understand science all he knows is that science has produced the miraculous sulfas and penicillin and now the world has been terrified by the discovery of atomic power. As a consequence, science has become to him a magic power. He feels that science can do anything. Why, then, with this feeling prevalent among the people who make up our juries should we expect our jurists to become suddenly cognizant of the true worth of scientific facts which may be more or less pertinent to the cases presented to them: It is conceivable that an innocent person might be convicted because blood on his suit coincided in type with that of the victim of a crime. That coincidence is not enough in itself to convict a man. But a jury, overly impressed with a misconception of the value of scientific facts, may be misled and hand down verdicts that are unjust.

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"Where scientific evidence is offered by admitted experts, there is a tendency by the jury to be overwhelmed by the conclusiveness of the scientific proof and be misled into attaching greater significance to this evidence than the scientist intended. In order that scientific proof may maintain its rightful position as conclusive evidence where it is conclusive on the issue, it would be best for courts not to admit such evidence to show a mere possibility (except when called for in answer to an explanation of accused) until the time when jurors (laymen) are sufficiently educated in the principles of logic and sufficiently trained in emotional control to comprehend the true value of such evidence and infer no greater significance than it logically deserves." 37 J.Crim.L. & C. 300, 303 (1947) (emphasis in original) (footnote omitted).

This emotional assessment of jurors as being incapable of understanding scientific testimony comports with the standard arguments offered by those who oppose the admissibility of any new scientific process. This Court foresaw such criticism in Shanks. It disposed of the argument by saying, "We see no valid objection in the idea that the jury (or the Court in this case) might attach too much importance to the scientific evidence, and might regard it as positive proof. . . . Judges and juries must be presumed to have average intelligence at least, and no assumption to the contrary can be made for the purpose of excluding otherwise admissible testimony." 185 Md. at 448-49, 45 A.2d at 90.

Although blood typing processes have been relatively noncontroversial, the case of *Groulx v. Groulx*, 98 N.H. 481, 103 A.2d 188 (1954), considered the admissibility of a new test for paternity based on the "S factor" in blood. The court said:

"Paternity of the plaintiff was excluded by Dr. Allen's report because of the genetic[391 A.2d 395] rule that a child cannot have the S factor in its blood cells unless S is also present in the blood cells of at least one of the parents. The report conceded that the genetic data

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was much greater in the blood groups A-B-O, M-N and Rh but gave two reasons which were said to counterbalance the paucity of family studies." *Id.* at 484, 103 A.2d at 190.

"After Dr. Allen's report was received by the court, Dr. A. S. Wiener of New York, a leading authority in blood grouping tests, wrote Dr. Allen that his conclusions as to exclusion of paternity based on the S factor alone were 'too strongly worded.' Thereupon Dr. Allen modified his original opinion in some details . . . but reaffirmed his essential conclusion . . ." Id. at 484-85, 103 A.2d at 190.

The New Hampshire Supreme Court pointed out:

"(I)t may be noted that scientific and medical evidence from qualified experts is generally accepted in this jurisdiction in both criminal and civil cases. (Citing cases.) Whatever defects there may be in this trend it at least avoids the common criticism made elsewhere that ' . . . trial courts have tended to lag far behind' in utilizing probative methods developed by medicine and science. Maguire, Evidence, Common Sense and Common Law (1947) 30." Id. at 483-84, 103 A.2d at 190.

The court found no error in admitting the testimony:

"We conclude that the blood grouping tests in this case were entitled to evidentiary weight even though they do not have the benefit of the full genetic data that is available in the more common blood groups such as A-B-O, M-N and Rh-Hr. See Andresen, The Human Blood Groups (1952) 43. In this respect the blood grouping tests were like other expert opinion evidence and entitled to such weight as the Trial Court wished to give them. See Ricard v. Insurance Co., 87 N.H. 31, 36, 173 A. 375." Id. at 485, 103 A.2d at 191.

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d. Intoxication

Chemical intoxication tests are now well established as an aid to law enforcement. "For a number of years, chemical intoxication tests have been routinely used to establish that a defendant had been driving a motor vehicle while under the influence of intoxicating liquor. In most states, statutes provide for the admissibility of the results of chemical tests for intoxication." Moenssens et al., *Supra*, § 6.39 at 291 (footnote omitted). See, e. g., Maryland Code (1974, 1977 Cum.Supp.) §§ 10-302 to -309, Courts and Judicial Proceedings Article.

The tests were not always so readily recognized. Writing in 1964, one commentator stated, "(T)here is no unanimity of scientific opinion as to the accuracy of the tests which have been developed, especially in regard to the accuracy of the breath tests." Kaplan, *Supra*, 10 Wayne L.Rev. at 405-06. In *People v. Bobczyk*, 343 Ill.App. 504, 99 N.E.2d 567 (1951), the defendant "contend(ed) that the trial court erred in permitting the introduction of evidence concerning the (Harger) drunkometer test and the result shown thereby, on the ground that the drunkometer ha(d) not received general scientific recognition as an accurate index of the amount of alcohol in the blood." Id. at 507, 99 N.E.2d at 568. The court was urged to follow *People v. Morse*, 325 Mich. 270, 38 N.W.2d 322 (1949), which held the admission of evidence based on this instrument to be reversible error, citing only lie-detector cases. In that case the Michigan court applied the Frye standard, and said the evidence of the breath test should have been excluded after five doctors called by the defense testified that most of the medical profession did not consider the drunkometer reliable. The Illinois court ruled that disagreement as to reliability goes to the weight, not the admissibility of the evidence:

"Defendant argues that there is a lack of unanimity in the medical profession as to whether intoxication can be determined by breath. Even so we think this [391 A.2d 396] objection goes to the weight of the testimony and does not destroy its admissibility. The evidence in this case shows that the experts called

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by the State are eminently qualified in the field in question. In our view the opinion in the case of *McKay v. State*, 155 Tex.Cr.R. 416, 235 S.W.2d 173 ((1951)), is best reasoned and most analogous to the present case." 343 Ill.App. 510-11, 99 N.E.2d 570.

The Supreme Court of Arizona considered the issue of the admissibility of evidence based on the Harger drunkometer in *State v. Olivas*, 77 Ariz. 118, 267 P.2d 893 (1954). The court noted that there was some disagreement among scientists as to the accuracy of the test. Referring to *Bobczyk*, the Arizona court said:

"In this last mentioned case, Illinois refused to follow *People v. Morse*, *supra*, and held that where there is a lack of unanimity in the medical profession whether intoxication can be determined by breath, the scientific disagreement affects only the weight and not the admissibility of evidence. We think this is the correct rule in tests of this character." Id. at 119, 267 P.2d at 894.

But cf. *Rivers v. Black*, 259 Ala. 528, 68 So.2d 2 (1953) (approving Frye test in dictum).

In *Kallnbach v. People*, 125 Colo. 144, 242 P.2d 222 (1952), it was determined by analysis of the defendant's blood using the Nicloux method that he was driving while intoxicated. The court concluded that the defendant's objections to the accuracy of the Nicloux method went to the weight of the evidence rather than to its admissibility:

"There was testimony introduced on defendant's behalf regarding the Nicloux method of blood analysis and questioning the accuracy thereof. Aside from any blood analysis, there was competent evidence sufficient to warrant the jury in determining that defendant, at the time of the accident, was driving under the influence of intoxicating liquor. Apart from the testimony of the registered medical technologist, the jury might properly have found defendant guilty as charged.

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Neither we, nor the jury, are sufficiently learned in the art of blood analysis to determine whether the Nicloux method or other of the methods to which defendant's physicians testified, is the better and more accurate method, but the weight to be given such testimony of this witness, as we have said, was a matter exclusively for the jury's determination, and we perceive no error in its reception." Id. at 149, 242 So.2d at 225.

e. Other scientific evidence

Perhaps the most extreme example of a court's not requiring "general acceptance" of a new technique as a prerequisite to admissibility is *Coppolino v. State*, 223 So.2d 68 (Fla.App.1968), Appeal dismissed, 234 So.2d 120 (Fla.1969), Cert. denied, 399 U.S. 927, 90 S.Ct. 2242, 26 L.Ed.2d 794 (1970). Coppolino was an anesthesiologist who was suspected of murdering his wife. An autopsy and general toxicological investigation disclosed no possible cause of death, although there was a needle injection tract in the left buttock of the deceased. The cause of death was suspected to be an overdose of succinylcholine chloride, a muscle relaxant which may cause a cessation of breathing. It was thought that this drug could not be detected in a person's body after death. A toxicologist named Umberger developed tests specifically for this case:

"The results of this 'general unknown' test were negative. Dr. Umberger then attempted to establish a method whereby he could determine if unusual amounts of the component parts of succinylcholine chloride were present in the body tissue. Dr. Umberger testified that some of his tests and procedures were standard ones and that some were new. As a result of his tests Dr. Umberger reached the conclusion, and so testified, that Carmela Coppolino received a toxic dose of succinylcholine chloride." Id. at 69.

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There was evidence that this was the first instance in which such procedures had been used:

[391 A.2d 397] "Several witnesses, including those called by the State, testified that prior to the performance of the tests in question it was believed impossible by medical scientists to demonstrate the presence of succinylcholine chloride or its component parts in the body." Id. at 70.

The court stated that the general rule for admissibility required only "reasonable demonstrability":

"The general rule regarding admission of scientific evidence is:

'Where the evidence is based solely upon scientific tests and experiments, it is essential that the reliability of the tests and results thereof shall be recognized and accepted by scientists or that the demonstration shall have passed from the stage of experimentation and uncertainty to that of reasonable demonstrability. * * * ' 2 Jones on Evidence § 457 (5th ed. 1958). See also 31 Am.Jur.2d Expert and Opinion Evidence § 44; Notes, Admissibility of Evidence Obtained by Scientific Devices and Analyses, 5 U.Fla.L.Rev. 5 (1952). " Id. at 70.

After quoting from *Frye*, the court said, "However, it is also a rule in Florida that the trial judge enjoys wide discretion in areas concerning the admission of evidence and that his ruling on admissibility of evidence will not be disturbed unless an abuse of discretion is shown." Id. at 70. The court then stated the appropriate standard for determining whether there had been an abuse of discretion: "The problem presented to the trial judge was, were the scientific tests performed by Umberger So unreliable and Scientifically unacceptable that their admission into evidence was error."

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Id. at 70 (emphasis added). It concluded, "On appeal it is incumbent for defendant to show that the trial judge abused his discretion. This the defendant has failed to do." Id. at 71.

Another scientific technique which was welcomed into the courts without discussion of general acceptance is the process of X-ray photography. Soon after X-rays were discovered by William von Roentgen in 1895, an X-ray photograph was introduced into evidence in the case of *Bruce v. Beall*, 99 Tenn. 303, 41 S.W. 445 (1897). Surely the art of reading X-rays must have been in its developmental stage at that point in time. However, the reviewing court found no error in admitting the evidence, stating:

"New as this process is, experiments made by scientific men, as shown by this record, have demonstrated its power to reveal to the natural eye the entire structure of the human body, and that its various parts can be photographed, as its exterior surface has been and now is. And no sound reason was assigned at the bar why a civil Court should not

avail itself of this invention, when it was apparent that it would serve to throw light on the matter in controversy. Maps and diagrams of the Locus in quo, drawn by hand, are often used to aid a Judge or a jury to an intelligent conception of the matters to be determined, and no one would think of questioning the competency of the testimony of a witness who stated that he knew the map or diagram to be entirely accurate, and who then used it to illustrate or make plain his statement. The pictorial representation of the condition of the broken leg of the plaintiff gave to the jury a much more intelligent idea of that particular injury than they would have obtained from any verbal description of it by a surgeon, even if he had used for the purpose the simplest terms of his art." Id. at 307-08, 41 S.W. at 446.

The theory behind the admissibility of this evidence was

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discussed in 1 S. Greenleaf, Law of Evidence § 439H (16th ed. J. Wigmore 1899):

"The use of photographs taken by the vacuum tube Roentgen rays may involve slightly different principles. Since the operator will usually not have perceived the object usually a concealed bone with his ordinary organs of vision, he will not be able to put forward the photograph as corresponding to the results of his own observation; nevertheless, if he can testify that the process is known to him (by experience or otherwise)[391 A.2d 398] to give correct representations, the photograph is in effect supported by his testimony, and stands on the same footing as a photograph of an object whose otherwise invisible details have been rendered discernible by a magnifying lens." Id. at 548-49 (footnote omitted).

Moenssens et al., Supra, note, referring to stereoscopic views, photographs, photomicrographs, photomicrographs, and X-rays, that "(t)here seems to have been no objection, ever since this early period, to the admittance in evidence of photographs of any kind, provided the accuracy and relevancy of them were duly established." Id. at 500.

Courts have also admitted testimony based on microanalysis of human hairs as evidence of positive identification:

"Although there is no known way yet of positively identifying hair as having come from a particular individual, except in a few rare instances, an ascertainment of similarity in color, structure, pigmentation and other characteristics can be of considerable probative value when considered along with other evidence against an accused person." Id. at 357, Moenssens et al., Supra.

"It must be reemphasized, however, that it is impossible to definitely state that a hair belongs to

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a given individual. The most that can be stated is that a questioned hair matches a hair sample of known origin in all microscopic characteristics." Id. at 358.

Despite the scientific inconclusiveness of identifications based on an examination of hair, an FBI expert was permitted to testify to a positive identification in *Padilla v. People*, 156 Colo. 186, 397 P.2d 741 (1964), where the court stated:

"We fail to comprehend how defendant could characterize it as incompetent, irrelevant and immaterial. One of the expert witnesses testified that he was given a strand of hair identified as having been found in the defendant's automobile, and that he took from the alleged victim samples of her hair and matched them in the FBI laboratory under procedures developed there. He testified unequivocally that the hairs were from one and the same person." Id. at 188, 397 P.2d at 743.

The court said, "We agree with the trial court's ruling that the testimony and the exhibits were admissible and relevant; the weight to be given to the particular evidence, however, was for the jury." Id. at 189, 397 P.2d at 743.

A similar result was reached in *State v. Andrews*, 86 R.I. 341, 134 A.2d 425, Cert. denied, 355 U.S. 898, 78 S.Ct. 274, 2 L.Ed.2d 195 (1957), a case involving the rape and murder of an 86 year old retired school teacher. Hair analysis was employed to identify the defendant as the perpetrator.

"The defendant, at the request of the police, gave them some of his pubic hairs and Dr. Harrison testified that he compared them with other hairs which he obtained from a pair of shorts and a red shirt which were taken from defendant's bedroom, and which defendant admitted had been worn by him, and also from the bed in which Miss Franklin was assaulted, and that they originated from the same source. The doctor also testified that a white hair which was taken from the red shirt of defendant had come from the head of Miss Franklin." Id. at 345, 134 A.2d at 428.

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On appeal, the defendant argued that Dr. Harrison should not have been allowed to give his opinion. The court rejected the argument:

"Doctor Harrison who had studied this subject for many years gave his opinion, as defendant says, 'by microscopic comparison' of the hairs in question. This was something he was better able to do than a jury.

"A hundred years ago in *Buffum v. Harris*, 5 R.I. 243, 251, Chief Justice Ames laid down the law which we believe has been uniformly followed here as to the use and the qualification of experts to assist the jury. The trial justice has rather wide discretion as to whether the subject matter admits of expert testimony. See 20 Am.Jur., Evidence, § 798, p. 671." *Id.* at 350-51, 134 A.2d at 431.

[391 A.2d 399] Moenssens et al. state that by examining the hair from an individual "it may usually be established whether he is Caucasian, Negroid, Mongoloid, or of mixed race. This is done primarily by a study of pigment distribution, cross section, and physical characteristics." *Id.* at 360, 134 A.2d 425. In *People v. Kirkwood*, 17 Ill.2d 23, 160 N.E.2d 766 (1959), Cert. denied, 363 U.S. 847, 80 S.Ct. 1623, 4 L.Ed.2d 1730 (1960), a police officer who had performed laboratory tests using microanalysis testified that hair found on the coat of a Negro defendant to a rape charge was from a white person. Although the expert admitted that the authorities disagreed as to the reliability of such a determination, the court found no error in permitting him to express his opinion on the subject:

"Defendant did object to the question of whether the hairs were from a white person or a colored person on the ground that there was no scientific basis for such a distinction. The witness then testified that there was some controversy by the authorities on the question, but that the witness's experience showed that such a distinction could be made. He was then permitted to answer the question and replied that in

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his opinion the hairs on both the sheet and the coat were from a white person. We believe that there was no error in permitting the witness to express his opinion on the question. The fact that there is a difference of opinion among the authorities goes to the weight of the evidence, rather than its admissibility." *Id.* at 32, 160 N.E.2d at 772.

Yet another scientific technique of disputed reliability which has been admitted by the courts is the Nalorphine or Nalline Pupil Test to detect the use of narcotics. Moenssens et al., *Supra*, at 280 report that it was "found that when Nalline was injected in non-users of narcotics, the pupils of the patients constricted markedly. Heavy users of narcotics, on the other hand, showed opposite pupillary responses." Problems with the process are discussed in Grupp, *The Nalline Test III Objections, Limitations and Assessment*, 62 J.Crim.L., C. & P.S. 286 (1971). Professor Grupp pointed to studies which indicated that "(a)s identified by the Nalline Test some subjects would be falsely accused of having drugs in their system. . . . (One study) indicates that as many as nine and seven-tenths per cent of the subjects would be falsely accused of having narcotics in their systems" *Id.* at 292.

In spite of the many asserted limitations of the Nalline Test, evidence based on that procedure was admitted to indicate use of narcotics in *People v. Williams*, 164 Cal.App.2d Supp. 858, 331 P.2d 251 (1958), one of the 28 cases cited in the majority opinion in support of the Frye test. Although the court there indicated at 860, 331 P.2d at 253 that "the results of tests of the type (t)here under attack, as well as opinions based thereon, are admissible only if the tests have gained acceptance in the field of learning in which they are in use," citing Frye among other cases, and, as the court put it, "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, general acceptance being at present limited to those

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few in a specialized field who deal with the narcotic problem," the court held the evidence admissible, saying: "Should this fact (I. e., lack of general acceptance) render the testimony inadmissible? We believe not. All of the medical testimony points to the reliability of the test. 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." *Id.* at 862, 331 P.2d at 254.

f. Lie detectors or polygraphs

Up to the present time courts have been nearly unanimous in rejecting testimony based on lie detectors or polygraphs. 13 One [391 A.2d 400] commentator concluded "that the courts, in considering the admissibility of lie detector evidence, have not merely excluded the evidence but have judged it by a different standard than the standard which is established for determining admissibility and applied to other scientific evidence." Kaplan, *Supra*, 10 Wayne L.Rev. at 381. This different standard originated with the first appellate decisions to consider the lie detector, Frye. The holding of that case, however, was grounded in the same principles that apply to other expert testimony; the appellate court merely refused to hold that the trial judge abused his discretion. We have heretofore fully discussed Frye together with the irony that another man later confessed to the crime which the tests indicated that Frye did not commit. 14

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Comment, *The Truth About the Lie Detector in Federal Court*, 51 *Temp.L.Q.* 69, 81 (1978), states, "(D)espite the obsolescence and peculiarities of *Frye*, few cases denying the admission of lie detector evidence have explained why *Frye* should be followed."

Upon examining the early lie detector cases, Kaplan, *Supra*, 10 *Wayne L.Rev.*, concluded:

"(T)he standards of admissibility by which lie detector evidence has been judged are general scientific acceptance and infallibility. Along the same vein, one writer says, in reference to the lie detector, 'if fallible in the slightest degree, it would be shocking to permit a life to be gambled upon the wheel of chance.'" *Id.* at 385 (emphasis in original) (footnote omitted).

Dean McCormick struck a similar note in his article, *Deception-Tests and the Law of Evidence*, 15 *Cal.L.Rev.* 484 (1927):

"The comments of some legal writers seem tacitly to assume that the deception-tests must be shown not only to be scientifically accepted as evidential or significant, but that they must be demonstrated to be error-proof. But it is apparent that no capacity for anything like a hundred per cent correctness of results is required. The emotional curve is to be admitted merely as circumstantial evidence of a truthful intent or the reverse. If the test results are shown by scientific experience to render the inferences of consciousness of falsity or truth substantially more probable, then the courts should accept the evidence, though the possibility of error in the inference be recognized. The admission of

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evidence that blood-hounds have followed a trail from the crime to the whereabouts of the accused, of evidence of similarity of footmarks, and of conduct to show insanity, are all striking examples of the fact that conclusiveness in the inference called for by the evidence is not a requirement for admissibility." *Id.* at 500 (footnotes omitted).

Noting the general rule that all relevant evidence should be admitted unless some rule of exclusion applies, Kaplan states:

"Referring back to the lie detector cases, it seems clear that the courts do not judge the admissibility of the evidence according to this procedure. Rather than considering the probative value of [391 A.2d 401] the evidence to see if it is *Prima facie* admissible and then the policies which weigh against admission, the courts assume that the evidence should be excluded unless it is shown that the lie detector has received 'general scientific acceptance' or is 'infallible.' In this way, the courts fail to identify the policy considerations against admission and hinder constructive attempts to provide safeguards against the dangers feared." 10 *Wayne L.Rev.* at 394 (emphasis in original).

Kaplan poses an interesting question:

"In reading through the cases on lie detector evidence, one may wonder why the courts have been so adamant in their refusal to admit such evidence that they appear to manipulate the standard applied in judging its admission. At the same time, the courts have been very liberal in accepting other developments of science." *Id.* at 409.

The answer he comes up with is that, unlike other scientific evidence which is circumstantial, polygraph evidence goes only to credibility, and there is no need for such evidence, since the jury is capable of deciding issues of credibility without the aid of a machine. See *id.* at 413-14.

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A similar rationale for distinguishing lie detectors from other scientific evidence was set forth by Chief Judge Gibson for the Eighth Circuit in *United States v. Alexander*, 526 F.2d 161 (8th Cir. 1975). It has been suggested that *Alexander* should become the leading case on the polygraph, displacing *Frye* :

"*Alexander's* careful analysis, focusing on strong arguments against admitting lie detector evidence, namely, its effect on the jury and its dubious reliability, is the first carefully reasoned rejection of lie detectors by a federal appellate court. Its conclusions, formed by the same court that decided the liberal (*United States v.*) *Oliver* decision, (525 F.2d 731 (8th Cir. 1975), *Cert. denied*, 424 U.S. 973, 96 S.Ct. 1477, 47 L.Ed.2d 743 (1976),) must be considered as representative of the reasons underlying the federal courts' reluctance to admit into evidence the results of lie detector tests. In short, *Alexander* appears likely to become the most important decision on the lie detector issue, replacing the obsolete and cursory analysis of *Frye*." Comment, *Supra*, 51 *Temp.L.Q.* at 94 (footnotes omitted).

In *Alexander*, Judge Gibson pointed out for the court that "the polygraph does not detect lies, but merely records physiological phenomena which are assumed to be related to conscious deception." 526 F.2d at 163. To similar effect, he quoted a 1965 report of the Committee on Government Operations of the House of Representatives, which concluded:

"There is no 'lie detector.' The polygraph machine is not a 'lie detector', nor does the operator who interprets the graphs detect 'lies.' The machine records physical responses which may or may not be connected with an emotional reaction and that reaction may or may not be related to guilt or innocence. Many, many physical and psychological factors make it possible for an individual to 'beat' the polygraph without detection by the machine or its

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operator." (Citing H.R.Rep.No.198, 89th Cong., 1st Sess. 13 (1965).) Id. at 165.

The court added, "Furthermore, it is often difficult to supply supportive and objective evidence to verify a polygraphist's conclusion as to a subject's veracity since there is no assured way in most cases to determine whether the subject was actually being truthful or deceitful." Id. at 165-66. The court said: "it is apparent that a polygraph examination embraces a number of complexities not present in the areas of fingerprint, handwriting, Voiceprint, ballistics and neutron activation analysis. These deal primarily with Physical phenomena rather than psychological responses." Id. at 167 (emphasis added). The court believed that this particular form of evidence has a great tendency to invade the province of the jury:

"(P)resent-day jurors, despite their sophistication and increased educational levels and intellectual capacities, are still likely to give significant, if not conclusive, weight to a polygraphist's opinion as [391 A.2d 402] to whether the defendant is being truthful or deceitful in his response to a question bearing on a dispositive issue in a criminal case. To the extent that the polygraph results are accepted as unimpeachable or conclusive by jurors, despite cautionary instructions by the trial judge, the jurors' traditional responsibility to collectively ascertain the facts and adjudge guilt or innocence is preempted." Id. at 168 (footnote omitted).

It is of interest that in *State v. Williams*, 388 A.2d 500 (Me.1978), in distinguishing *State v. Casale*, 150 Me. 310, 110 A.2d 588 (1954), a lie detector case which applied a Frye -type standard, the court said:

"The reference to a special standard of admissibility in *Casale*, however, was occasioned by the peculiarly special nature of lie detector tests as evidence. Lie detector evidence directly and pervasively impinges upon that function which is so

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uniquely the prerogative of the jury as fact-finder: to decide the credibility of witnesses. The admissibility of lie detector evidence therefore poses the serious danger that a mechanical device, rather than the judgment of the jury, will decide credibility." Id. at 502 (footnote omitted).

The court in *Alexander* went on to distinguish other scientific evidence, including spectrographic analysis:

"It may be argued that all forms of scientific evidence may have a substantial effect upon jurors and may tend to invade the factfinding province of the jury; thus, polygraph evidence is not objectionable on this basis. However, polygraph evidence is distinguishable from other types of scientific evidence in that its scope is much broader. Scientific evidence based on ballistic analysis, fingerprint comparison, handwriting analysis, voiceprint or spectrographic analysis, and neutron activation analysis is elicited solely for the purpose of identifying either an individual or an object allegedly involved in the perpetration of a criminal act. 16

16 These various types of scientific evidence have been stated to be further distinguishable from polygraph evidence since they 'are much more susceptible to controlled experimental verification.' *United States v. Wilson*, (361 F.Supp. 510, 513 (D.Md.1973)). Some have concluded that testimony bearing on the identification of individuals or their psychiatric condition should be admitted despite its disadvantages because it is indispensable to the trial process. In contrast, polygraph evidence is not necessary since the jury is

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capable of performing the function served by the polygraph. *United States v. Wilson*, supra at 514; Cf. *United States v. Brown*, 149 U.S.App.D.C. 43, 461 F.2d 134, 145-46 n. 1 (1971) (Bazelon, C. J., dissenting)." Id. at 169.

These scientific tests do not purport to indicate with any degree of conclusiveness that the defendant who is so identified or connected with the object actually committed the crime. The jury, after receiving such expert testimony, has the additional responsibility of reviewing other facts which tend to prove or disprove defendant's connection with the crime and, if participation is shown, the jury may further be required to ascertain the defendant's mental state at the time of the crime in appropriate cases."

It may be that, for the reasons given in *Alexander*, it is proper to treat evidence based on the polygraph differently from other scientific evidence. The distinction as to physical vs. psychological phenomena is clearly applicable to spectrographic voice analysis. The polygraph does not record "lies," but only records physiological responses such as blood pressure and respiration. The spectrograph, on the other hand, produces a graphic representation of the voice, and there is no dispute that this chart is an accurate "recording" of the voice as broken

down into three components. Additionally, in the case of the spectrograph, the juror is able to use his own senses to evaluate the conclusion of the expert.

g. Summary

The distinctions noted in *Alexander and Williams* would seem to account for the position of Professor Irving Younger, who has stated, "Yes, bring on the radar, the spectrogram voice identification, and the neutron activation analysis to show us what happened. Yet when it is time to decide what is right, what is decent, what is just, I [391 A.2d 403] want no machine buzzing 'the truth' at me. . . . Keep the lie detectors out of the courthouse: I'll go with a judge and a jury any day." Younger, *On Technology and the Law of Evidence*, 49 *U.Colo.L.Rev.* 1, 7-8 (1977) (footnotes omitted).

Not being subject to the special considerations which apply to the lie detector, other types of scientific evidence would appear to be properly admissible when relevant under the general rule, without regard to "general acceptance." 15

The standard used by courts generally for the admission of evidence in such matters as fingerprints, ballistics,

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intoxication tests, and X-rays is substantially different from that enunciated in *Frye*. It may be noted that in *People v. Jennings*, 252 Ill. 534, 96 N.E. 1077, the first fingerprint case, the Illinois court employed a two-step analysis: (1) whether the Prints were admissible, and (2) whether expert testimony thereon was appropriate. A similar analysis applied to the spectrogram might simplify the entire controversy. It is beyond dispute that the spectrogram is an accurate graphic representation of various components of a voice. It would follow, therefore, that the voiceprint itself clearly would be admissible in cases in which a comparison of voices is material. Further, this is an appropriate subject for expert commentary, the typical lay juror being unskilled in examining such "pictures" of voices. It would appear then that the spectrographic examiner should be allowed to express his opinion that there are enough similarities between the spectrograms for him to conclude that the voices were the same.

3. Holdings of this Court relative to scientific evidence and admission of expert testimony

The position of this Court relative to the admission of scientific evidence and the admission of expert testimony generally has been much closer to the view of Dean McCormick and the opinions of the courts in *United States v. Baller*, 519 F.2d 463 (4th Cir.), Cert. denied, 423 U.S. 1019, 96 S.Ct. 456, 46 L.Ed.2d 391 (1975); *United States v. Franks*, 511 F.2d 25 (6th Cir.), Cert. denied, 422 U.S. 1042, 95 S.Ct. 2656, 45 L.Ed.2d 693 (1975); and *State v. Williams*, 388 A.2d 500 (Me.1978), than to that in *Frye*. I shall discuss *Baller*, *Franks*, and *Williams* in part 4 of this opinion.

In *Nizer v. Phelps*, 252 Md. 185, 192-93, 249 A.2d 112, 116-17 (1969), we observed that it is well established that it is in the sound discretion of the trial judge to determine whether or not a witness is competent to testify as an expert and "whether or

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not the expert testimony will be of appreciable help to the jury" Similar statements by this Court abound. In *Shivers v. Carnaggio*, 223 Md. 585, 589, 165 A.2d 898, 900 (1960), the Court, in an opinion by Judge Hammond, strongly supports the theory of Wigmore and McCormick as to when expert testimony will be admissible, "namely that the opinion should be rejected only when it is superfluous in the sense that it will be of no value to the jury." The Court there quoted from *Williams v. Dawidowicz*, 209 Md. 77, 87, 120 A.2d 399, 404 (1956), where our predecessors said: "If the expert opinion is reasonably calculated to assist the jury, and not to confuse it, such testimony is admissible, in the sound discretion of the trial court" More recently, in *Raithel v. State*, 280 Md. 291, 301, 372 A.2d 1069, 1074 (1977), Judge Levine said for the Court, "(T)he admissibility of expert testimony is a matter largely within the discretion of the trial court, and its action in admitting or excluding such testimony will seldom constitute a ground for reversal," [391 A.2d 404] citing cases. Putting it in a slightly different manner, in *Newkirk v. State*, 134 Md. 310, 318, 106 A. 694 (1919), Judge Burke for our predecessors quoted from *Chateaugay Ore & Iron Company v. Blake*, 144 U.S. 476, 484, 12 S.Ct. 731, 732, 36 L.Ed. 510 (1892). The Supreme Court there said, "How much knowledge a witness must possess before a party is entitled to his opinion as an expert is a matter which, in the nature of things, must be left largely to the discretion of the trial court, and its ruling thereon will not be disturbed unless clearly erroneous." Relative to expert testimony, See also *Farley v. Yerman*, 231 Md. 444, 451, 190 A.2d 773 (1963).

I have previously referred to *Shanks v. State*, 185 Md. 437, 45 A.2d 85 (1945), concerning evidence pertaining to blood.

Since Shanks this Court has held repeatedly that evidence which tends to identify the accused as the criminal is admissible without regard to positiveness, the lack of positiveness going only to the weight of the evidence. For example, in *Barber v. State*, 191 Md. 555, 62 A.2d 616 (1948), Judge Henderson said for the Court: "The appellant contends that the piece of cloth found in the automobile owned by his father was

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improperly admitted in evidence. But we have held that 'a lack of positive identification of an instrument of crime affects the weight of the evidence rather than its admissibility.' *Wilson v. State*, 181 Md. 1, 5, 26 A.2d 770, 773. See also *Shanks v. State*, 185 Md. 437, 447, 45 A.2d 85, 163 A.L.R. 931, and *Smith v. State*, 182 Md. 176, 184, 32 A.2d 863." *Id.* at 566-67, 62 A.2d at 621.

Similarly in *Daniels v. State*, 213 Md. 90, 131 A.2d 267 (1957), the Court said:

"We repeat what we previously said that if there is a probability that there is a connection between the evidence and the crime, it is admissible, and the extent of its connection is a matter for the determination of the jury. 'The real test of admissibility is the connection of the fact proved with the offense charged, as evidence which has a natural tendency to establish the fact at issue should be admitted.' *Hitzelberger v. State*, 174 Md. 152, 161, 197 A. 605, 609." *Id.* at 103, 131 A.2d at 273.

Daniels was cited in *Hursey v. State*, 233 Md. 243, 244, 196 A.2d 472 (1964), in upholding an in-court identification by a witness who had been unable to identify the defendant at the police lineup. See also *Parker v. State*, 189 Md. 244, 247, 55 A.2d 784 (1947), noting that evidence as to Possible cause is permitted.

In *Nixon v. State*, 204 Md. 475, 105 A.2d 243 (1954), the defendant claimed that he had been attacked by the victim, who allegedly had beaten him with a "waxer handle" apparently the handle of a mop-like wax applicator. The Court said:

"However, the trial court definitely ruled out a proffer of testimony by Dr. Charles Baker, a biochemist and microbiologist employed by Penniman and Brown, chemists, to the effect that an examination of the waxer handle revealed that there was on the handle waxy material in which was embedded red fibers, identical with the fibers of the

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appellant's red shirt, and that there was waxy material embedded in the fabric of the shirt. In short, the proffer was to prove by scientific analysis that the handle and the shirt had come into contact, and by inference that Lassiter had struck Nixon with the handle." *Id.* at 480, 105 A.2d at 245.

The Court did not discuss the reliability of scientific fiber analysis, the main objection being a lack of an adequate chain of custody. However, in holding the exclusion to be reversible error, the Court said:

"In the instant case, the possibility that red fibers, identical to those of which the shirt of the accused was made as determined by chemical and microscopic examination, could have become embedded in the waxer handle subsequent to the shooting, is so remote as to be negligible." *Id.* at 483, 105 A.2d at 247.

Other cases sanctioning scientific evidence of varying degrees of conclusiveness include: *Nizer v. Phelps*, 252 Md. at 193-94, 249 A.2d 112 (point of impact); *Acme Poultry Corp. v. Melville*, 188 Md. 365, 370-74, [391 A.2d 405] 53 A.2d 1 (1947) (automobile skid marks), *Accord, State v. Gray*, 227 Md. 318, 322, 176 A.2d 867 (1962); *Corens v. State*, 185 Md. 561, 569, 45 A.2d 340 (1946) (chemical analysis of blood); *Langenfelder v. Thompson*, 179 Md. 502, 507, 20 A.2d 491 (1941) (opinions of medical experts admissible as to the cause which might have produced a certain physical condition); *Councilman v. Towson Bank*, 103 Md. 469, 478-79, 64 A. 358 (1906) (cashier permitted to testify as to genuineness of a signature); and *Williams v. State*, 64 Md. 384, 393, 1 A. 887, 890 (1885) ("It is well settled that an expert may give an opinion not only as to the nature and effect of an injury, but also the manner or instrument by which it was inflicted."). See also the catalog of items of scientific evidence received by the courts of this State set forth by Chief Judge Gilbert for the Court of Special Appeals in *Reed v. State*, 35 Md.App. at 480, 372 A.2d 243.

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In *McGuire v. State*, 200 Md. 601, 92 A.2d 582 (1952), Judge Henderson said for the Court:

"The appellant contends that there was no sufficient identification of the voice of McGuire, as heard by the officers making the wire tap and recorded on the machine. At that time, of course, neither of the officers had ever seen McGuire, but Officer Glass testified at the trial, after the conversations with him on June 25, that he recognized his voice and that he was the same person who talked to Hess on several prior occasions answering to the name of 'Mack.' It may be noted that the officer not only heard these conversations through earphones, but heard the record played back at the time it was transcribed. It is quite immaterial that he heard McGuire in person after having heard

his voice on the telephone, rather than before. At the time of the trial he was in a position to make the comparison and his testimony was clearly admissible. *Lenoir v. State*, 197 Md. 495, 504, 80 A.2d 3, 7; *Rowan v. State*, 175 Md. 547, 558, 3 A.2d 753; *Wigmore, Evidence* (3d ed.) § 2155(a). Both officers testified that they identified Hess as the person taking and placing bets on the phone and this identification is not challenged." 17 Id. 605-06, 92 A.2d at 584.

Ironically, under McGuire the majority would find no error had the testimony of the expert been simply that after listening to the recorded voice of the individual who had called the prosecuting witness and recordings of the voice of Reed it was his opinion that the voices were identical. 18 It is because

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he stated a reason for his conclusion that the voices are identical, not relying solely upon his aural comparison, that the case goes back for a new trial, although Chief Judge Prescott said in *Miller v. Abrahams*, 239 Md. 263, 273, 211 A.2d 309, 314 (1965), a zoning case, "the prevailing general rule, almost universally followed, is that an expert's opinion is of no greater probative value than the soundness of his reasons given therefor will warrant. Cf. *State, etc. v. Critzer*, 230 Md. 286, 186 A.2d 586." *Accord, Surkovich v. Doub*, 258 Md. 263, 272, 265 A.2d 447 (1970); and *Creswell v. Baltimore Aviation*, 257 Md. 712, 721, 264 A.2d 838 (1970).

[391 A.2d 406] From this review of Maryland cases it will be seen that this Court has not followed anything similar to a Frye standard. Our holdings are in line with the cases I have reviewed from other states in part 2 of this opinion.

4. Holdings of other courts relative to voice identification and spectrographic analysis

In each instance where an appellate court has rejected spectrographic analysis of voices, it has been upon the basis of Frye. See *United States v. McDaniel*, 176 U.S.App.D.C. 60, 538 F.2d 408 (1976); *United States v. Addison*, 162 U.S.App.D.C. 199, 498 F.2d 741 (1974); *People v. Kelly*, 17 Cal.3d 24, 130 Cal.Rptr. 144, 549 P.2d 1240 (1976); *People v. Tobey*, 401 Mich. 141, 257 N.W.2d 537 (1977); *State v. Cary*, 49 N.J. 343, 230 A.2d 384 (1967); and *Commonwealth v. Topa*, 471 Pa. 223, 369 A.2d 1277 (1977). 19 Actually, *McDaniel* was decided not on

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the basis of Frye, but on the basis of Addison. The trial court's action in permitting expert spectrographic voice identification testimony was found to be harmless error. I find it of interest that the *McDaniel* court said:

"Unfortunately, however, the overwhelming weight of judicial precedent upon which the trial judge relied has evolved outside this judicial circuit. Appellant predictably relies on *United States v. Addison*, 162 U.S.App.D.C. 199, 498 F.2d 741 (1974), in which a division of this court recently held that 'techniques of speaker identification by spectrogram comparison have not attained the general acceptance of the scientific community to the degree required in this jurisdiction by Frye (*V. United States*, 54 App.D.C. 46, 293 F. 1013 (1923)).' Id. at 745. Admittedly, Addison was decided almost two years ago, at a time when the new technique may have been less widely accepted than today. Since Addison, numerous other courts have examined the question of whether so-called voiceprints are sufficiently reliable to justify their admissibility, and all but a few have concluded that they are. It may well be that the time has come to reexamine the holding of Addison in light of the apparently increased reliability and general acceptance in the scientific community of using

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spectrographic analysis techniques for voice identification purposes." 176 U.S.App.D.C. at 64, 538 F.2d at 412-13.

"Because Addison was so recently decided, its shadow looms over our consideration of this issue. The reliability of spectrographic voice identification and its general acceptability within the scientific community may have changed so dramatically in the past two years that we may explain that earlier opinion as a reflection of the then primitive state of spectrographic voice identification. Absent a clear showing that this is so, however, or En banc reconsideration of Addison, we are bound by the prior opinion, and spectrographic voice identification evidence remains inadmissible in this circuit at this time." Id. at 65, 538 F.2d at 413.

[391 A.2d 407] The Supreme Court of New Jersey returned to the area in *State v. Andretta*, 61 N.J. 544, 296 A.2d 644 (1972). *Cary*, 49 N.J. 343, 230 A.2d 384 and *Andretta* were written by the same judge. The court said in its later opinion:

"Certainly the voiceprint method today has much more support for its admissibility as evidence than at the time of Cary. Dr. Tosi's study increases the knowledge we have of this method's reliability, and the admission into evidence of Lieutenant Nash's identifications in *Trimble* and *Raymond* demonstrates growing judicial acceptance. However, we need not decide at this time whether results of voiceprint analysis will be routinely admissible at trial. The narrow issue before us is whether the defendants should be compelled to speak for the voiceprint test. The significant scientific experiments and recent judicial acceptance of the voiceprint method since Cary convince us

that the support for this method now rests on considerably more than the word of a single man. In light of the developments since Cary, we believe that

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it is no longer unreasonable to order these defendants to speak for purposes of this test." *Id.* 61 N.J. at 551, 296 A.2d at 648.

Eliminating from the equation opinions which were reversed (E. g., *United States v. Raymond*, 337 F.Supp. 641 (D.D.C.1972), *Rev'd sub nom. Addison*, 162 U.S.App.D.C. 199, 498 F.2d 741) or overruled (E. g., appellate court opinions in California supplanted by the holdings of the Supreme Court of California in *Kelly*, 17 Cal.3d 24, 130 Cal.Rptr. 144, 549 P.2d 1240), there are substantially more reported opinions admitting such testimony than there are rejecting it. See *United States v. Jenkins*, 525 F.2d 819 (6th Cir. 1975); *United States v. Baller*, 519 F.2d 463 (4th Cir.), *Cert. denied*, 423 U.S. 1019, 96 S.Ct. 456, 46 L.Ed.2d 391 (1975); *United States v. Franks*, 511 F.2d 25 (6th Cir.), *Cert. denied*, 422 U.S. 1042, 95 S.Ct. 2656, 45 L.Ed.2d 693 (1975); *United States v. Williams*, 443 F.Supp. 269 (S.D.N.Y.1977); *United States v. Sample*, 378 F.Supp. 44 (E.D.Pa.1974); *Alea v. State*, 265 So.2d 96 (Fla.App.1972); *Worley v. State*, 263 So.2d 613 (Fla.App.1972); *State v. Williams*, 388 A.2d 500 (Me.1978); *Commonwealth v. Vitello*, 367 Mass. 224, 327 N.E.2d 819 (1975); *Commonwealth v. Lykus*, 367 Mass. 191, 327 N.E.2d 671 (1975); *State ex rel. Trimble v. Hedman*, 291 Minn. 442, 192 N.W.2d 432 (1971); *People v. Evans*, 90 Misc.2d 195, 393 N.Y.S.2d 674 (Sup.Ct.1977); *People v. Rogers*, 86 Misc.2d 868, 385 N.Y.S.2d 228 (Sup.Ct.1976); and *State v. Olderman*, 44 Ohio App.2d 130, 336 N.E.2d 442 (1975), all of which approve admission. See also *Annot.*, 49 A.L.R.3d 915 (1973); likewise see the full discussion of this technique in 19 *Am.Jur. Proof of Facts* 423-41 (1967), and the supplements thereto. *Greene, Voiceprint Identification: The Case in Favor of Admissibility*, 13 *Am.Crim.L.R.* 171, 184-85 (1975), states, "Fourteen of 15 United States District Court judges who have ruled on the issue of admissibility have accepted voiceprint evidence, while all but two of the 37 state tribunals which have reached the issue have held such evidence admissible. The single Canadian court which has been presented with the issue has also found in favor of admissibility of voice prints." 20

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Jenkins, 525 F.2d 819, relied upon *Franks*, 511 F.2d 25, which had been decided earlier that year by the same court. In *Franks* the Sixth Circuit court said:

"Although we, of course, are aware of the differences of judicial and scientific opinion concerning the use of voiceprints, we also are mindful of 'a considerable area of discretion on the part of the trial judge in admitting or refusing to admit' evidence based on scientific processes. *United States v. Stifel*, 433 F.2d 431, 437 (6th Cir. 1970), *cert. denied*, 401 U.S. 994, 91 S.Ct. 1232, 28 L.Ed.2d 531 (1971).

'(N)either newness nor lack of absolute certainty in a test suffices to render it inadmissible in court. Every useful new development must have its [391 A.2d 408] first day in court. And court records are full of the conflicting opinions of doctors, engineers and accountants . . . ' 433 F.2d at 438.

Moreover, *Stifel* recognized that Those opposing the admissibility of scientific tests can direct their criticisms toward the weight of such evidence. Applying *Stifel*, which admitted expert testimony concerning neutron activation analysis, we find that the district court was within its discretion in admitting voiceprint analysis. The district court qualified the expert voiceprint witness only after an extensive 25-page inquiry into his qualifications and the reliability of the scientific process; defense counsel were permitted to cross-examine the witness concerning his purported role as an advocate of the process and some other courts' refusals to admit voiceprint evidence. Moreover, neither *Britton* nor *Mitchell* produced a witness rebutting the government's claim that voiceprint analysis is sufficiently accurate to be admissible. " *Id.* at 33 (emphasis added) (footnotes omitted).

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In *Baller*, 519 F.2d 463, the Fourth Circuit summarized the theories behind spectrographic identification and said, "The scientific principles of the technique have been so exhaustively chronicled that we need only summarize them. See, e. g., *Commonwealth v. Lykus*, 367 Mass. 191, 327 N.E.2d 671 (1975)." It noted, "A majority of state courts which have considered the question since the Tosi study favor admissibility. Significantly, this group includes New Jersey, which previously had excluded such evidence." In determining that the evidence was admissible the court relied on principles which have been enunciated by this Court many times. After observing that "(t)here are good reasons why not every ostensibly scientific technique should be recognized as the basis for expert testimony," the court said:

"Deciding whether these conditions have been met is normally within the discretion of the trial judge. *United States v. Brumley*, 466 F.2d 911 (10th Cir. 1972); *Fineberg v. United States*, 393 F.2d 417 (9th Cir. 1968). Absolute

certainty of result or unanimity of scientific opinion is not required for admissibility. 'Every useful new development must have its first day in court. And court records are full of the conflicting opinions of doctors, engineers, and accountants, to name just a few of the legions of expert witnesses.' *United States v. Stifel*, 433 F.2d 431, 438 (6th Cir. 1970). Unless an exaggerated popular opinion of the accuracy of a particular technique makes its use prejudicial or likely to mislead the jury, it is better to admit relevant scientific evidence in the same manner as other expert testimony and allow its weight to be attacked by cross-examination and refutation. *United States v. Stifel*, supra; *Coppolino v. State*, 223 So.2d 68 (Fla.App.1968); See *McCormick*, Evidence § 203 at 490-91 (2d ed. 1972)." *Id.* at 466.

It noted that "the tapes of Baller's voice exemplars and all of the bomb threats were played so that the jury could make its own aural comparisons," that "the court instructed the

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jury that the spectrograms were only a basis for Lt. Nash's opinion and that they could disregard his testimony if they decided that his opinion was not based on adequate education or experience or that his 'professed science of voiceprint identification' was not sufficiently reliable, accurate, and dependable," and that the trial judge "also cautioned the jury that they need not accept (Lt. Nash's) opinion if they believed the reasons supporting it were unsound or if contradictory evidence cast doubt on it." A similar procedure was followed and similar instructions were given in this case.

In *United States v. Williams*, 443 F.Supp. 269, one of the more recent decisions upon the subject (decided December 20, 1977), the spectrographic analysis sought to be introduced had been conducted by an individual described as "a voice print specialist employed by the U. S. Bureau of Alcohol, Tobacco and Firearms . . ." The expert proponents of admission were Dr. Tosi and Dr. Henry Truby. Dr. Louis J. Gerstman was the opponent. The court held:

[391 A.2d 409] "I find that voice identification by aural comparison and spectrographic analysis has probative value; that the technique of spectrographic analysis has been accepted by a substantial section of the scientific community concerned; that the government's proposed expert in this field, Mr. Frederick Lundgren, is qualified; and that the jury will not be misled by such evidence. I have therefore ruled that evidence of spectrographic voice analysis and identification will be admitted in this case." *Id.* at 273.

Neither *Alea*, 265 So.2d 96, nor *Worley*, 263 So.2d 613, relied upon *Frye*. I find of interest the concurring opinion of Judge Mager in *Worley*, where he said:

"I fail to discern a distinctive difference between the analysis and identification of a voice by an expert based Solely upon the scientific reproduction thereof (i. e. voiceprints) and the identification of a voice by a lay witness based merely upon hearing the voice.

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Simon v. State, Fla.App.1968, 209 So.2d 682. It would seem that in each instance the question becomes one more properly relating to the Weight or Value to be given to such identification or testimony by the trier of fact. Clearly the victim of a threat or an obscene call is permitted to testify as to the identification of such voice by comparison with that of the alleged perpetrator. See *Cason v. State*, (Fla.App., 211 So.2d 604) supra; *Weinshenker v. State*, (Fla.App., 223 So.2d 561) supra; and *Simon v. State*, supra. See also annotation in 24 A.L.R.3d 1261." *Id.* at 615 (emphasis in original).

The Massachusetts court in *Lykus*, 367 Mass. 191, 327 N.E.2d 671, rested its decision squarely on the *Frye* standard, stating:

"Limited in number though the experts may be, the requirement of the *Frye* rule of general acceptability is satisfied, in our opinion, if the principle is generally accepted by those who would be expected to be familiar with its use." *Id.* at 203, 327 N.E.2d at 677.

The court emphasized the language used in *People v. Williams*, 164 Cal.App.2d Supp. 858, 861-62, 331 P.2d 251 (1958), saying, "It has been generally accepted by those who would be expected to be familiar with its use," to which the California court added, "In this age of specialization more should not be required." 367 Mass. at 203, 327 N.E.2d at 678. The court in *Lykus* noted a suggestion "that the requirement of general acceptance, as in . . . *Frye* and (*Commonwealth v.*) *Fatalo* (, 346 Mass. 266, 191 N.E.2d 479 (1963)) . . ., should be modified or abandoned." The *Frye* standard was adopted in Massachusetts in *Fatalo*. The court then said:

"See *McCormick*, Evidence § 203, p. 491 (2d ed. 1972), where it is said, ' "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

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other reasons for exclusion.' The suggestions by this author and others (see the concurring opinion of Mager, J., in the Worley case, *Supra*, 263 So.2d 613, 615 (1972)) urge that the opinions of a qualified expert should be received and that the considerations similar to those expressed in the Frye and Fatalo cases should be for the fact finder as to weight and value of the opinions.

"There is no need for modification of the general principle of the Frye or Fatalo cases in order to uphold the judge's ruling in this case. Examination of (1) the evidence as to admissibility presented before the judge, (2) judicial opinions from other jurisdictions, and (3) relevant scientific writings provides convincing proof to justify admission of the evidence. The considerable reliability proved by the Tosi experiment, the greatly added reliability induced by the application of further skills by the experienced examiner working under forensic conditions, and the totality of the evidence received at the voir dire hearing which tended to minimize the importance and weight of adverse or skeptical writings all serve to support a conclusion of general acceptability as required by the rule of the Fatalo and Frye cases.

[391 A.2d 410] "We hold that there was no error in the admission of the contested opinions of Lt. Nash." 367 Mass. at 203-05, 327 N.E.2d at 678-79 (footnote omitted).

In Trimble, 291 Minn. 442, 192 N.W.2d 432, the Minnesota court observed:

"In view of the fact that identification by aural voice comparison, either respecting telephone conversations or words spoken at a lineup, or recorded by other mechanical means is admissible, and the admission that voice comparisons by spectrograms corroborate identification by means of ear, we are convinced that spectrograms ought to be admissible at least for the purpose of corroborating opinions as to identification by means of ear alone.

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They ought also to be admissible for the purpose of impeachment. The weight and credibility of such evidence lie with the finder of facts, but that does not involve the question of admissibility." *Id.* at 457-58, 192 N.W.2d at 441.

It then went on to say, "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," a statement which should sound familiar to Maryland lawyers. See, e. g., *Yudkin v. State*, 229 Md. 223, 229, 182 A.2d 798 (1962).

State v. Williams, 388 A.2d 500 (Me.1978), is the most recent spectrographic decision concerning which I have any knowledge. The Maine court said that Williams' "position on appeal (was) that it was error to admit the speech spectrograph evidence because the scientific community has not generally accepted the speech spectrograph as a scientifically reliable method of voice identification." Thus, it said "(t)he threshold question" with which it was "confront(ed) (was) to determine what standard, under the law of evidence, governs Admissibility in relation to the type of evidence (t)here involved." (Emphasis in original.) Williams sought application of the Frye test. After discussing the Maine Rules of Evidence, adopted in 1976, which are patterned after the Federal Rules of Evidence, the court alluded to that portion of *McCormick, Evidence*, § 203 at 491 (2d ed. 1972), from which I have previously quoted and said:

"In accordance with the provisions, and basic spirit, of our Rules of Evidence in regard to the admissibility of expert testimony, we conclude that there is no justifiable distinction in principle arising because such expert testimony may happen to involve newly ascertained or newly applied scientific principles. The controlling criteria regarding the admissibility of expert testimony, so long as the proffered expert is qualified and probative value is not substantially outweighed by the factors mentioned in Rule 403, are whether in the sound

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discretion of the presiding Justice the testimony to be given is relevant and will assist the trier of fact to understand the evidence or to determine a fact in issue.

"In particular cases where the expert testimony proffered rests on newly ascertained, or applied, scientific principles, a stronger showing may become necessary before the presiding Justice is satisfied that the preconditions of admissibility, in terms of relevance and helpfulness to the fact-finder, have been met. Thus, in the particular circumstances of a given case the presiding Justice may see fit to place greater emphasis on the consideration whether or not the scientific matters involved in the proffered testimony have been generally accepted or conform to a generally accepted explanatory theory. Cf. *United States v. Baller*, 519 F.2d 463, 466 (4th Cir. 1975) and *United States v. Brown*, 557 F.2d 541, 556 (6th Cir. 1977). The Justice may believe this appropriate either (1) to avoid prejudice which might arise because the assertion that the principle, or technique, has a 'scientific' basis may import an objectivity which could unduly influence the jury as a lay fact-finder or (2) to assist the presiding Justice in his responsibility to determine relevance, within the definition of Rule 401 M.R.Evid., i. e., whether the proffered

testimony is likely to make the existence of any fact or consequence more probable or less probable than it would be without the evidence.

[391 A.2d 411] "This however, is not the same as saying, as does the Frye rule, that the presiding Justice is Bound by an additional, Independently controlling standard which exists over and above relevance (Rule 401 M.R.Evid.) and the capability of the expert testimony to assist the trier of fact (Rule 702 M.R.Evid.). On the approach we adopt the presiding Justice will be allowed a latitude, which the Frye rule denies, to hold admissible in a particular case proffered evidence involving newly ascertained, or applied,

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scientific principles which have not yet achieved general acceptance in whatever might be thought to be the applicable scientific community, if a showing has been made which satisfies the Justice that the proffered evidence is sufficiently reliable to be held relevant. Cf. *United States v. Franks*, 511 F.2d 25, 33 (6th Cir. 1975)." Id. at 503-04.

The court concluded "that it was not error for the presiding Justice to admit the expert voice identification testimony in th(at) case" by reason "of the evidence of reliability presented by Dr. Tosi," adding that the trial judge "was justified in finding that the spectrograph principle was sufficiently reliable to qualify as 'relevant' within the definition of Rule 401 M.R.Evid., and that the qualified expert testimony based on it could be of assistance to the jury as fact-finder."

Of particular interest is the concurring opinion of Justice Nichols. He observed that the Maine Rules of Evidence were "modeled after the Federal Rules of Evidence" He was of the view that the Maine court "should continue to adhere to the Frye standard." However, on the basis of *Baller*, supra, 519 F.2d 463, and *Lykus*, supra, 367 Mass. 191, 327 N.E.2d 671, he said that "(t)here is sufficient basis in those cases to uphold the admission of spectrographic evidence in the trial of the . . . case (then before the Maine court) without abandoning the important protections which Frye affords."

The majority opinion in the case at bar states, "(I)t is the almost unanimous opinion in recent legal commentaries that the voiceprint technique does not satisfy the standards articulated in *Frye v. United States*." It refers to six law review articles, two of which were by the same individual. Included in its six are three student articles. Thus, I have no hesitancy in pointing to student comments which have approved admission of such evidence. See Note, *Evidence Spectrographic Method of Voice Identification Tendency of the Courts Toward Admitting Scientific Evidence*, 12 *Wake Forest L.Rev.* 879 (1976); Comment, *Supra*, 44 *Cinn.L.Rev.* 616 (1975); Comment, *Supra*, 1975 *Wash.U.L.Q.* 775 (1975); Note, *Supra*, 18 *Wayne L.Rev.* 1365, 1397; and Note, *Supra*,

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13 *N.Y.L.F.* 679, 745-51 (1968). In Note, *Voiceprint Identification: The Trend Towards Admissibility*, 9 *New England L.Rev.* 419, 430 (1975), it is stated, "The trend since 1971 has most decidedly been to admit voiceprint evidence, at least for the purpose of corroboration" Admission of such testimony is supported by *Boren*, *The Voiceprint Staging a Comeback*, 3 *U.San Fern.V.L.Rev.* 1 (1974); *Gorecki*, *Supra*, 77 *Mil.L.Rev.* 167 (1977); and, of course, by *Greene*, *Supra*, 13 *Am.Crim.L.Rev.* 171 (1975); and *Decker & Handler*, *Supra*, 26 *Am.U.L.Rev.* 314, 316 (1977).

5. Application of the Frye test to the evidence in this case

a. By the trial judge

I shall now proceed to an analysis of that which the trial judge had before him when he ruled upon the admissibility of evidence as to spectrographic analysis of voices. I believe that even if a showing of scientific acceptance were required, it cannot be said that Judge McAuliffe erred in admitting the evidence of voice identification here. Four experts were produced by the State and one by the defense at the preliminary hearing on this subject. 21

[391 A.2d 412] Dr. Tosi was the first witness produced by the State. The trial judge said relative to his background:

"Dr. Tosi is a scientist of unimpeachable credentials in this area. . . . I think it fair to say that Dr. Tosi is the leading authority in this country and perhaps in the world on voice identification by spectrographic analysis, or more properly stated, with the aid of spectrographic analysis. He appears to have testified in most of the reported cases and

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he said here that he had made some 50 to 55 court appearances on this subject. He has conducted controlled experiments which have been widely acclaimed for the utilization of approved scientific methodology."

The defense stated, "(W)e agree Dr. Tosi is qualified. We don't challenge his qualifications."

Tosi indicated he had been involved in spectrographic analysis for over 25 years, but his experience in connection with voice identification did not begin until 1966. 22 He had been skeptical of the process here in issue prior to his studies in 1968. In that year he was engaged by the Michigan State Police to evaluate Kersta's system of voice identification. Dr. Tosi told the trial judge that at that time his "opinion was that

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the method need(ed) more studies, more data in order to reach a final conclusion." 23 Dr. Tosi testified that he "said in (his) report, 'The method shows promise. However, I need more data to reach a (final) conclusion and make up my mind.'"

The trial judge noted:

"The entire concept of voice identification through the aid of spectrograms got off to a bad start when Kersta, who obviously had a commercial interest as well as a scientific interest, very early on in the game and after some experiments on his own pronounced the system infallible. [391 A.2d 413] This had the effect that one might anticipate in the scientific community, which was, if not quite horror, at least resentment.

"Dr. Tosi said that he resented the fact that this man would propose this relatively new system as being infallible. Dr. Tosi testified in one of the earlier cases and said that based upon his observations the use of spectrograms for voice identification showed promise, but it needed more study and more particularly it needed a scientific approach, some controlled experiments, scientifically constructed and supervised and interpreted, and that in the absence of such controlled experiments using approved methodology he was unwilling to say that it was sufficiently reliable for courtroom acceptance. Acting under a grant given him by the United States Department of Justice Dr. Tosi did undertake just such a study as he described as being needed in the field, which resulted in some 35,000 trials of voice identification. I will not go into all of the details of his study since the details are in the record and have been discussed by courts elsewhere."

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Judge McAuliffe commented relative to these tests:

"These tests, which took approximately two years, were completed in December of 1970 and the statistical data was obtained through the utilization of computers. The most significant result for our purposes is that there was a mean of 6.3 percent false identifications and a mean of 12 percent false eliminations.

"It is terribly important to keep in mind the difference between false identification and false elimination. False identifications are simply those in which the examiner says that these two samples match when in fact they do not. False eliminations of course occur when one fails to say that two samples match when in fact they do. Forensically, and I am not talking about the investigatory stage now, I am talking about the prosecution in court of a criminal case, we are vitally concerned with errors of a false identification. We are generally and certainly in this case before the Court not very much concerned with errors of false elimination, although it is a factor that we must consider in making this preliminary determination. But it has nowhere near the significance of errors of false identification. The reasons are obvious. If the examiner is presented with a recording of the actual perpetrator's voice and with a recording of a defendant's voice and he erroneously eliminates a defendant as being the same voice as the offender, he has not thereby caused an innocent man to be convicted. However, if he makes a false identification and says they are the same when in fact they are not, the consequences are much more grave. At least that is our system of American jurisprudence. We are very much concerned that we not convict innocent people and that is our primary concern.

". . . (I)n this country (we) are terribly interested in errors of false identification. Obviously the public

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at large has an interest in errors of false elimination, but this will be more of a consequence on the investigatory level than it would be at trial.

"Now we note that these results were reached when considering all of the testing done as to the decisions reached in these four categories. Tosi then asked the computer what the percentage of error of false identification would have been if we considered only those responses of the examiners which were almost certain or fairly certain, thereby not considering the fairly uncertain or almost uncertain responses. This was a valid projection because it equates to forensic situations. We would not permit any expert to testify that he was almost uncertain or fairly uncertain in attempting to make identification. In the medical field we have always required reasonable medical probability and in the scientific field reasonable scientific probability. This is sometimes what I think erroneously is spoken of as reasonable scientific certainty. The answer to that question [391 A.2d 414] was that considering only the results

generated by the almost certain and fairly certain responses we reduced the error of false identification to 2.4 percent. Furthermore, Tosi has extrapolated, if you will, his finding or projected finding on what he considers to be (a) proper scientific thesis, that the reliability would further be increased and the percentage of error on a false identification would further be diminished if in fact certain safeguards and cautions were employed forensically which were not employed by him in testing.

"Now Dr. Tosi says that not only scientific logic, but common sense dictates that if these added safeguards are cranked into the system, that the error of 2.4 percent false identification will be even more significantly diminished. Dr. Tosi himself has

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examined some 80,000 spectrograms. He testified that there is general acceptance of this technique among the scientists actually working in the field or genuinely familiar with the field. He recounted the names of those that he considers so qualified and says that 15 or 16 of these approved, and he named them, and he named some three or five that opposed. (24 He noted that those who opposed have commented on the possible effect as yet not totally known of poor recordings, noise distortion, psychological factors such as the emotions of the speaker, stress of the speaker, physical makeup of the speaker, the time lag between the samples, the effects of intentionally disguising one's voice, and with regard to all of these factors, some of which he has studied to some extent, but as to most of which he agrees further studies are in order, that the most that these elements could do would be to increase the possible error of false elimination and would not increase the error of false identification. He said if you have a poor recording with a lot of noise, your examiner is going to opt for no opinion because it is just not good enough to allow him to express an opinion. If stress or other emotions cause a change in the voice pitch, it is going to make it more difficult, therefore, to be a finding of a match. So you may have a false elimination. It is the same with time lag, which might cause a change in the voice, and the effect of disguising the voice would be to increase the chance of error of false elimination, but not to increase, in his opinion, the error of false identification.

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"Dr. Tosi said that the acceptability for identification in court should not be less than 10 matching words, and Sergeant Smrkovski agrees with him in this regard."

The next expert presented by the State was Dr. Leendert Peter Christian Jansen from South Africa, a new character in court controversies concerning this technique, who holds a master's degree in physics and electrical engineering. His thesis was written entirely on speaker identification. Judge McAuliffe observed relative to him:

"Dr. Jansen is currently working and has been working under a grant in South Africa on speaker identification research. He, like Dr. Tosi, and indeed like many of the scientists in his field, was originally skeptical and then after he had done some studies and felt that there was an 80 to 90 percent accuracy, he concluded that this was not good enough for courtroom use in his opinion. He took several trips to the United States, visited a number of scientists, looked around, read the [391 A.2d 415] literature, and, on his first visit here in connection with his voice identification process, he reported that growing numbers of American courts were accepting the process and more work was being done. This gave rise to a more intensive studies program being initiated in South Africa, and now (summer of 1975) he is here under intensive training. He says he came with an essentially open mind, although somewhat skeptical. But having studied intensively here and having gotten into the real workings of voice identification with the aid of spectrograms he now believes that if the examiner uses sufficient care and has sufficient training, he can make positive identifications.

"Dr. Jansen is impressed particularly by the availability to the examiner of telltale interformant energy peaks. These are involuntary energy peaks. They are more subtle than the other lines and indeed

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they may be represented by the absence of lines, spaces or shadings. Dr. Jansen was particularly impressed by the fact that these interformant energy peaks might well provide, and to him do provide, the so-called clinchers for positive identification in many cases. Dr. Jansen said that of the people he met who had recognized expertise in this particular field, only one spoke against the process, and this I believe was Dr. (Fausto Poza).

"I would comment that Dr. Jansen is perhaps more conservative than the Court would be with regard to his approval of the use of (this) type of evidence. He impressed me as wanting to be near certain before he would agree to the use of it, and yet he now believes that it is generally acceptable among those who are truly familiar with it and it has obtained the reliability, or the reliability has been demonstrated to him in such fashion that he believes that properly done and with the properly trained examiner it should be utilized in the forensic courtroom situation."

Jansen's first study of spectrographic voice identification was in 1964. It was because of differences of opinion which he originally found in the field that in 1974, as he put it, he "visited people who spoke against the method and for the method." In response to a question as to whether he met with Dr. Bolt and other critics (Dr. Bolt being one of the prime opponents), he replied that he had spent "(a)pproximately one day with each of those people" during his 1974 study-tour of the United States. At the end of this period he was still skeptical of the process. He was asked whether his initial opinion that the process was "unreliable was enhanced by (his) contacts with Dr. Bolt's group." He replied:

"A Well, since you ask the question, I have to be honest and tell you that many of those people did not speak against the use of spectrograms for identifying people. They spoke against the use for use in law courts. And most of them were convinced

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such spectrograms had good value for comparing speakers. What they had against the method being used in courts of law was the main argument that they thought that it is not objective, the method is not objective enough, and also, it is not possible for the examiner to state a definite percentage of accuracy, or conversely, of error, in his finding. Those were the main arguments against the method.

"Q I take it up until June of 1975 you were in agreement with them; in basic agreement?

"A Yes.

"Q It wasn't until you spent 150 or 200 hours with Dr. Tosi that you changed your opinion?

"A That is correct.

"Q Do you think your opinion might be affected if you spent the same amount of time again with Dr. Bolt and his group?

"A The answer is no, because these people were not involved in comparing spectrograms. There is nobody who I could have gone to who could prove to me that the method does not work."

[391 A.2d 416] Of the individuals whom he had met whom he regarded as having expertise in the field, which was "only about six or seven people," he said only "one of them spoke against the method." He testified that he was advised by Bolt personally that he did not "consider himself an expert on spectrographic comparisons." The negative position was that of Fausto Poza. He observed relative to him:

"A No, I don't, but I can tell you this concerning that case, that I have not been completely convinced

"THE WITNESS: of his integrity in stating that he felt (such) evidence should not be allowed in court. In his case there were other motives that could cause him to say that.

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"BY MR. SHAW:

"Q What were those motives?

"A Financial. For one thing, I know he applied for grants for studies in this field, and obviously if he spoke for the case there would be no reason for the grant being given to him because of the previous grant given to Dr. Tosi, the results of those studies.

"In other words, the Courts have decided the results of Dr. Tosi's studies were sufficient. You would have to have a very good reason to come with something that is opposite to that."

Dr. Jensen explained his conversion:

"THE COURT: . . .

"We have talked in somewhat general terms . . . (.) Dr. Jensen. Apparently you were unconvinced that the reliability had gotten high enough for your purposes for you to recommend the use of voiceprint or spectrographic analysis in courts of law until you had done further work and saw some of the refinements and techniques being employed.

"What particularly did you see? What is new to you, or what has changed your opinion in this regard, and why?

"THE WITNESS: Yes. I think I can say it in terms of this exhibit we have here. The bold lines drawn in there refer to the formants of the speech. Previously I used only those lines in comparing speakers. What I found when I came here was that very often there is additional information around those lines, bordering them or in between them, that is not really relevant to the speech, but this additional information I felt can sometimes be extremely useful for identifying the speaker. I may say that I found that that information is not always there. In other words, you cannot take any two samples of one and the same person's voice in which he says one and the same thing. I don't think you are going to find all those things. You have got to keep

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comparing some of the samples until you do find something like that. If the people are not the same, you are not going to find that. I have never found it in my experience. But if you do find those similarities, then in my experience I only found that when the people were actually the same. It is never that the people were not the same and that you found these kinds of similarities.

"THE COURT: Would this be, for example, the lapse or space that occurs between words in speech?

"THE WITNESS: Not so much that, Your Honor. I can say that these main black lines would be its main regions of energy. The other thing I am talking about are to a certain extent secondary regions of energy. A person controls the main line. That is what is needed to understand the speech. He does not try to control the secondary amount of energy from his mouth. That is not really relevant to the speech, and because he doesn't really bother about controlling that, it always turns out that remains very constant, even though he tries to change his voice to make it different. He is not aware of these secondary amounts of energy.

"THE COURT: How are they depicted or shown?

"THE WITNESS: They are shown as much fainter lines. They are not nearly as dark as the main regions. They are very faint. Sometimes they are not even [391 A.2d 417] there. When you do find them in both cases, you can see how closely these would resemble each other.

"THE COURT: In your prior studies you used apparently examiners with no prior training?

"THE WITNESS: That's right, Your Honor.

"THE COURT: One of your qualifications in changing your opinion is that the examiners be competently trained?

"THE WITNESS: Very much. Having seen this process and experienced this happening, I realized

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an examiner is not going to make full use of a spectrogram unless he has got a great amount of training in this field. If he hasn't got that that is what I found with the people I visited last year, as well as the other people that were against the method: They could only compare the main regions of energy. They had themselves no personal knowledge of these aspects which I found could be used to make comparisons.

"THE COURT: If those other similarities did not occur; if you could not find those between your questioned and your known, you yourself would be unwilling to express an opinion they were one and the same?

"THE WITNESS: Yes, Your Honor. The most one could say in a case like that is there is a resemblance. I doubt that opinion would be expressed.

"THE COURT: That is what is taught by Dr. Tosi? In other words, is your feeling consistent with his, as far as you know from studying under him?

"THE WITNESS: Yes, I believe so.

"THE COURT: Mr. Wood.

"BY MR. WOOD (defense counsel):

"Q Is there a name for these subtle faint lines?

"A It is sometimes called vertical striations.

"Q How do you spell that?

"A S-t-r-i-a-t-i-o-n-s; but that does not explain all of these things. There is, as far as I know, no definite name, except sometimes it is called interformant energy peaks.

"Q And you in your opinion would need to see either vertical striations or these interformant energy peaks in both tapes or both spectrographs before being able to form your opinion?

"A Before being able to feel certain that the unknown and known samples are the same or from

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the same person. My experience to a certain extent has been it is sometimes easier under good circumstances to be certain voices are the same than the opposite, to be certain they are not the same, because these additional information things I spoke about can be present when the speakers are the same, but when they are not the same, then you never find these things. Although the main regions may be quite similar for just about all the samples you compare, so you are never sure. Do you understand what I mean?

"THE COURT: Trying to prove a negative: When they are absent you are unable to say with certainty, in your opinion.

"THE WITNESS: It may happen, yes. I have had experience of some cases like that."

The third expert was Detective Sgt. Smrkovski, the officer in charge of the voice identification unit of the Michigan State Police. He is a member of the Acoustical Society of America and other societies. The trial judge said of his testimony:

"Smrkovski reported certain forensic studies in addition to the lab studies and reported that a survey of actual cases, field cases where there had been an identification utilizing spectrograms, that of all those cases 85 percent of the defendants have either admitted their guilt or pled guilty thereafter. Now there is some criticism about this and some valid criticism that a plea of guilty is not always proof certain, but nonetheless we think there are significant statistics for actual field study.

[391 A.2d 418] "Sergeant Smrkovski testified this is an extremely reliable method if one uses both aural and visual comparisons and if the examiner is properly trained, which he defined rather fully, and I will not repeat here. . . . He gave some interesting statistics on the actual work done at the Michigan State Lab and of all the forensic cases sent there the examiners in 60

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percent of the cases have expressed no opinion. In 40 percent of the cases, therefore, they have expressed an opinion of some kind, and on a three to one ratio these opinions eliminated suspects."

The State's last expert was Dr. John McClung of Wayne State University. His master's degree was in the field of audiology and physical science, and his Ph.D. was in the field of speech science. He stated specifically that he had not studied under Dr. Tosi, describing himself as "self-taught." 25 One of the courses which he teaches is "Speech Pathology," which involves the operation of sound spectrographs and production of sound spectrograms. He indicated that he was then engaged in studies and experimentation "as a result of the objections by Dr. Kenneth Stevens, Dr. Louis Gerstman, and Fausto Poza in trial proceedings such as this." In response to a question as to whether he was doing this "to try to give more information, so that (he) c(ould) learn more about the subject," he replied:

"A No, sir. I am sufficiently convinced in my own opinion as to the reliability and validity of the procedure. One of the purposes of this specific project is to obtain data to demonstrate to these other gentlemen I have mentioned support for my conviction on the reliability and validity."

In answer to a question as to his opinion "as to the reliability of the process of voice identification by sound spectrography," he said:

"THE WITNESS: My opinion is that the procedure itself would have a reliability of approximately in my opinion 95 percent accuracy in identifying the a proper identification of the two prints coming from the same speaker or two different speakers."

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The sole witness produced in opposition to the Admissibility of the evidence was Dr. Joseph Baker, an Associate Professor of Hearing and Speech at the University of Maryland with a master's and doctorate in hearing and speech science. The trial judge described him as being "mostly familiar with this particular area of voice identification through the assistance of spectrograms by his reading of articles in the area, although he has done some class demonstrations with the spectrograph and he is familiar with the use of the machine, having used it in other areas of the hearing and speech science." He has never conducted any controlled experimentation in voice identification using spectrograms. In response to a question as to whether "the process of voice identification by spectrographic comparison (is) reliable," he said:

"A I do not feel that the state of the art is sufficiently advanced to answer that question affirmatively. So I say no."

At another point the record reflects relative to the examination of Dr. Baker:

"Q What general field would you put voice identification and using spectrographic analysis?"

"A My best answer to that would be one, that it is a field associated with speech sciences. It interacts and interphases with forensic law.

"Q Let me ask you the question this way: Has voice identification using spectrographic analysis gained a general acceptance in that field that you just designated?"

"MR. SHAW (prosecutor): I object. That is irrelevant as to that field and also there is no foundation.

[391 A.2d 419] "MR. WOOD (defense counsel): Your Honor, we have been here since 10 this morning talking about the foundation being the expertise of Dr. Baker in his field. All I am asking him for now is a further opinion on the general acceptance of this process.

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"THE COURT: Well, Dr. Baker, who cares and worries and argues and writes and studies about this?"

"THE WITNESS: Voice scientists. Some people call themselves phoneticians.

"THE COURT: Among that group who would be able or who would have made themselves able and interested in the field, and I am restricting this question to, do you have an opinion as to whether there has been generally accepted as a reliable or valid method for the aid of voice identification?

"THE WITNESS: I do not believe it has been accepted.

"THE COURT: Again it calls for a yes or no answer. Do you have such an opinion?

"THE WITNESS: Yes.

"THE COURT: All right.

"BY MR. WOOD:

"Q What is that opinion?

"THE WITNESS: I do not believe that it is an accepted procedure. That is my opinion."

The record further reflects relative to the cross-examination of Dr. Baker:

"Q How can you say it is not generally accepted if you do not know how many people we are talking about?

"A From the literature I have been reading I do not find it as an acceptable procedure.

"Q You did not find that it is generally accepted, but that literature is not necessarily written by persons actively in spectrography?

"A Again that is how you define that group. Do you

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include the Bolt group in that definition? Do you include members of the Speech Communications Section of the Acoustical Society of America that voted (against) in numbers 42 to 0?

"Q What you are saying is from the majority of articles that you have read they are opposed?

"A The majority of articles in my purview that have to deal with this are not necessarily positive in their characterization of the proceeding.

"Q That is your basis of your opinion that it is not generally accepted?

"A That is correct.

"Q What you are saying is that the whole process is a matter of observing two spectrographs?

"A No, I said two or more.

"Q And determining whether or not it is the same individual?

"A Whether or not those two particular displays are in fact of the same individual, that is correct. That is the essence of the technique.

"Q But your definition of the technique would not include that same trained expert listening to a tape itself, would it?

"A Well now this morning I believe the question was raised about this as far as whether you could in fact look at these without making the things themselves and whether you did in fact have to listen to material to make sure it was in fact correctly reproduced for the machine to analyze it.

"Q I am trying to get you to define the term that we have all been using all day, voice comparison by sound spectrography. Does that method mean comparing of one or more spectrograms, or does it mean that comparison in addition to trained experts listening to it?

"A It depends on how you want to define sound

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spectrography, how you want to define voice identification.

"Q Define it.

"A I have said it the way it is. Now if you want to include, if one wants to, it is perfectly all right with me, as long as you set up the ball game, if you want to include by listening also, that is another [391 A.2d 420] way to accomplish speaker identification, by listening. It is another set of procedures that can be done that way.

"Q Everything that you have been talking about up to now, did it include listening to it as well, is that correct, because nobody defined the ball game that way for you yet?

"A I do not remember in my answers to questions constantly keeping in mind that we were also talking about an aural exercise of listening to make the decision of these particular spectrograms.

"Q Well is listening to it alone considered by you to be a valid procedure?

"A No, because I think it introduces the whole problem of voice disguise and attempts to disguise a voice."

In other words, this lone expert produced by the defense on the issue of admissibility in opposition to the technique used and said by four experts on behalf of the prosecution to be a valid one was not sufficiently familiar with that technique to know that it involved two of man's senses, hearing and seeing. It would appear that there is no way that one could feel, smell, or taste the comparison. Thus, the only two senses that could be brought to bear on

the matter of identification were brought to bear. Since Dr. Baker was of the view that one could not by hearing say that two voices were identical our case law to the contrary notwithstanding it follows that he was of the view that

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there was just no way that one could opine that two voices were the same. It appears, as the trial judge pointed out, he apparently was looking for Mathematical certainty rather than Probability, and probability is the basis for testifying in court.

The cross-examination of Dr. Baker continued:

"THE COURT: The question right now is, as I understand it, if one assumes that the trained examiner makes an identification, that it says that he is reasonably certain that they are the same only when he has had the benefit of spectrograph as well as aural comparison and only when he is satisfied by aural comparison as well as spectrographic analysis they are one and the same voice. If that is the criteria, Dr. Baker, and the examiner will not express an affirmative opinion that will match it when any of that is missing, would that change your opinion as to the essential reliability of the procedure?"

"I will allow him to answer that question.

"THE WITNESS: I know of no other way to answer it other than to say yes, any particular additional procedures that would cause the elimination of errors would be certainly advisable, but as I have tried to explain, the inclusion of another procedure does not necessarily eliminate all of the problems associated with this.

"Now again we are talking about two different procedures. One is by ear and one is by eye.

"BY MR. SHAW:

"Q Are you able to answer the question? For some reason you are not. I have no problem with it. Can you state an opinion as to the validity of using both the visual and aural together in one analysis and where both of those agree?"

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"MR. WOOD: I object. He already answered that question. He has testified that he considers it not reliable.

"THE COURT: I am going to overrule your objection.

"THE WITNESS: I have no opinion." (Emphasis added.)

There was an attempt to rehabilitate him on redirect examination:

"THE COURT: . . . You may answer.

"Given no ground rules other than an examiner comparing and using both spectrographic analysis and aural comparison of the specimens, do you have an opinion as to the reliability of the procedure?"

"THE WITNESS: Yes, I have an opinion.

BY MR. WOOD:

"Q What is that opinion?"

[391 A.2d 421] "A My opinion is that the combination of the two methods could conceivably introduce greater false identification and/or false elimination into the proceeding, could conceivably.

"Q But specifically on the point is it or is it not a valid procedure, using those two aspects?"

"A I don't consider it to be a valid procedure."

At another point the record reflects:

"THE COURT: I gather from what you have said you have found it helpful in your work to have the spectrogram?"

"THE WITNESS: Yes.

"THE COURT: That it does reduce to a visual picture one's voice?"

"THE WITNESS: That is right.

"THE COURT: And not just one component, but in several?"

"THE WITNESS: Yes."

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With this background it is easy to see why Dr. Baker's testimony, the only evidence adduced on behalf of the defense on the issue of admissibility, did not undermine the State's evidence relative to the reliability of voice identification by spectrographic analysis which had been heard by Judge McAuliffe. He characterized Dr. Baker's testimony in this manner:

"I find that Dr. Baker has an excellent background generally in speech science, but voice comparisons by spectrographic means or otherwise is clearly a peripheral field of interest to him. He testified that the state of the art is not sufficiently advanced to permit him to say that voice identification by spectrogram is reliable. He is particularly concerned about what he believes to be unknown effects of noise and the consequent degradation of the signals and the effects of stress on the voice. We have noted earlier that Dr. Tosi addressed himself to these issues

and felt that while study was needed, he had introduced some noise into his experiments and that the introduction of noise or stress or psychological factors should only serve to increase errors in false eliminations and would not increase the percentage of error of false identification. Dr. Baker testified that the Tosi studies were scientifically legitimate. But Dr. Baker would desire more studies.

"We think that Dr. Baker is one of the people that Judge Tim Murphy spoke of in the Brown case when he spoke of the scientific desire of certitude. We agree scientists like things to be precise and exact and mathematically reliable and without variation, and that is a fine desire, but the court and the law has never held that to be the standard for the admissibility of scientific evidence. We must remember the scientific bent which affects the judgment of some of these people and keep in mind our independent responsibility to make a judgment of reliability and general acceptance based on our

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criteria. If we did not decide cases except where things were absolutely and mathematically certain, we would not ever decide cases. Even in a criminal case proof beyond a reasonable doubt does not require mathematical certainty.

"We also note about Dr. Baker that he thinks that listening alone is not a valid way of making a voice identification. But we know that courts have long and universally accepted this testimony, that a witness who has heard two conversations has been permitted to testify that they are by the same person. Perhaps the earliest case and the one generally cited in Maryland is Rowan v. State, 175 Md. 547, (3 A.2d 753) and our leading case is McGuire v. State, 200 Md. 601, (92 A.2d 582). There is Lenoir v. State, 197 Md. at 495, (80 A.2d 3), and there is Dyson v. State, 238 Md. 398, (209 A.2d 609). These are all cases standing for the proposition that a witness may testify after having heard someone speak, and, being familiar with the defendant's voice or having heard the defendant speak, express an opinion that they are one and the same or they are not the same. It is very significant that the courts universally have permitted lay witnesses to express an opinion on voice identifications from merely hearing. It pretty well points out the difference between the philosophy of the [391 A.2d 422] scientists who are adamant in their quest for certitude and properly so. We do not disagree with that. But it points out the difference between their approach and the necessity of our approach, which is something short of certitude, but certainly we want it to be reasonably reliable.

"Dr. Baker thinks that the process or technique has not gained scientific acceptance in this field. But we note that Dr. Baker was unaware, for example, of Ladefoged's at least conditioned shift. Ladefoged had once testified in opposition to the technique and more recently in the case of the District of Columbia, had at least shifted his position, although not

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entirely, but generally as a proponent, excluding I think in cases where women's voices were involved or there were intentional attempts at disguising the voice. Dr. Baker was not familiar with the type of experimentation used by Helene. Dr. Baker thought that Dr. Mike Hecker was an opponent, although Tosi says he is not, he is now a proponent. Dr. Baker had not read the Hazen Study, but had only read a summary of it.

"Furthermore, Dr. Baker first said he had no opinion as to whether it would be valid or reliable to make a voice identification if one used aural together with visual and used a trained examiner who would not say it was a match unless he was satisfied both aurally and visually, and then on redirect said that he thought this would not be valid."

Any careful review of the testimony of Dr. Baker, the sole expert produced in an effort to show that there was not acceptance of the spectrographic voice analysis technique in the scientific community, would surely reveal that it is a miserably weak crutch upon which to lean in excluding this evidence.

In concluding "that the voice identification with the aid of spectrograms is and should be admissible in the State of Maryland," the trial judge limited his ruling "to male voices," with certain provisos:

- 1 That there was present "a properly trained examiner . . ."
- 2 "(T)hat the jury or trier of fact is permitted to listen to the tape, and the spectrograms upon which the opinion is offered or made available for inspection by the trier of fact . . ."
- 3 "(T)hat cautionary instructions were given to the jury."
- 4 That counsel were specifically forbidden by the trial judge to refer to the technique here as "voiceprint" so as to eliminate any possibility

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that it might be confused with fingerprints as to accuracy.

5 That the right of the defense be preserved "to produce experts to testify concerning their opinion as to reliability of this process and indeed to allow the defendant to produce other spectrograms for comparison if the defense so desires."

It was pursuant to this determination of the trial judge that the defense produced its second expert, Dr. Hollien. He attacked the spectrographic voice analysis technique before the jury and testified that in his opinion after listening to the exemplars of Reed's voice and the recording of the telephone calls to the victim that the voices were not of the same person.

The instructions of the trial court to the jury include:

"Ladies and gentlemen, the rules of evidence ordinarily do not permit a witness to testify as to his opinions or conclusions. There are exceptions. I think in the course of this trial you have learned that even a person without prior experience or expertise, particular experience, training or expertise, is permitted by our law if they are familiar with a particular voice or have heard a particular voice, to express an opinion as to whether another voice is the same as or different from the other voice which they heard. But generally speaking, a witness is not allowed to express an opinion or a conclusion. An expert witness is an exception to this rule.

"A witness who by education and experience has become expert in any art, science[391 A.2d 423] or profession, may be permitted to state his opinion as to a matter in which he is versed and which is material to the case. He may also state the reasons for that opinion. This testimony should be considered and weighed by you like any other evidence in the case and given the weight to which you deem the opinion to be entitled.

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"You may reject the opinion if the facts upon which it is based have not been established to your satisfaction by the evidence, or if you are not satisfied with the reasons given in support of the opinion. Where expert witnesses disagree, it is for you to decide which one, if either, is to be believed.

"In this particular case, ladies and gentlemen, you have heard testimony pertaining to voice identification with the aid of spectrographic analysis. The same rules apply to that type of testimony as I just gave you. It is your function to weigh the testimony of the various witnesses when they are testifying in that area and to assign such weight as you deem proper. You may give such testimony no weight at all, some weight, or much weight, as you find it to be entitled."

It should be noted that A. Moenssens et al., *Supra*, § 1.03 states:

"The 'particular field' which the court in the Frye case had in mind was the combined one of physiology and psychology. Such General recognition is no longer required, nor should it be. Sufficient to satisfy judicial caution should be recognition of reliability accorded by a Speciality within a general field of science." *Id.* at 4 (emphasis in original).

This is the basis upon which Judge McAuliffe relied. He said:

"This Court concludes that if we use the pure Frye standards that the testimony before me is persuasive, that this evidence should be admitted; that there is a general acceptance, though not a universal acceptance, within the group actually engaged in the use of this technique and in experimentation with this technique. Stated a little bit differently we find that speaker identification by visual comparisons of spectrograms when accompanied by aural examinations and comparison and when accomplished by a properly trained

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examiner has now received general acceptance by recognized experts familiar with such procedures and has reached standards of scientific acceptance and reliability necessary for admissibility into evidence and, therefore, ultimate consideration by the trier of fact."

It will be recalled that the California court in *People v. Williams*, *supra*, 164 Cal.App.2d Supp. 858, 862, 331 P.2d 251, 254 said of the Nalline test, "All of the medical testimony points to the reliability of the test. 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." It will further be recalled that in *Commonwealth v. Lykus*, *supra*, 367 Mass. 191, 203, 327 N.E.2d 671, this language was repeated.

b. The majority opinion

On April 10, 1978, we ordered that this case be reargued so that the full Court might consider it. 26 We directed that new briefs be filed and that the parties should address themselves to certain specific questions, including whether the Frye test should be adopted; if it were adopted, by whom the determination of general scientific acceptance should be made; and, if by the trial judge, the standard of review. 27

[391 A.2d 424]

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I find disappointing the fact that the majority opinion does not address itself more directly to these issues. The appellant was of the view that it was a question of fact as to whether a given technique has general scientific

acceptance, which makes a lot of sense to me. If it were a question of fact, then obviously the determination would be by the trial judge and the standard for review would be the clearly erroneous basis specified in Maryland Rules 886 and 1086.

From the majority opinion, I find myself somewhat puzzled as to what groups are to be considered in determining whether a process has general scientific acceptance and what knowledge, qualifications, and experience are required in order for one to offer an opinion on the subject. In the case at hand I would suppose that anyone with graduate training in the field of physics would be a member "of the relevant scientific community . . . whose scientific background and training (would be) sufficient to allow (him) to comprehend and understand the process and form a judgment about it," to use the majority's words. Are we to undertake some kind of poll to determine whether there is general acceptance or that the technique would be generally accepted by all of those so trained if they were informed as to what tests have been performed?

What practical basis is a trial judge to use in determining whether a technique has general scientific acceptance? Will we now upon the basis of the language in the majority opinion be considering the view in a case such as this of one who has never done any experiments or testing in the field (such as Dr. Baker who did not even know that an examiner listened to each exemplar), and then adding up those opinions to

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determine that there is general scientific acceptance or a lack of general scientific acceptance?

We regularly permit eyewitness identification in court. Certainly voice is no more unreliable than eyewitness identification. See the documented instances of erroneous identification set forth by B. Wentworth et al., *Personal Identification* 26-27 (2d ed. 1932). For example, in one instance a man mistakenly thought a person he saw on a train was his good friend who had been the best man at his wedding. In another instance a person mistook a man he saw on a train for his college roommate. 28

Upon close analysis it seems apparent that the majority can come up with only two "compelling reasons" for adopting the Frye test for this type of evidence. One is the jury's incompetence to evaluate expert testimony. The second "compelling" justification is to insure a minimal reserve of experts. The majority opinion states:

[391 A.2d 425] "In addition to the advantage of substituting scientific for lay judgment as to scientific reliability, the court in *United States v. Addison*, supra, 162 U.S.App.D.C. 199, 498 F.2d at 744, pointed out that the Frye test ' . . . protects prosecution and defense alike by assuring that a minimal reserve of experts exists who can critically examine the validity of a scientific determination in a particular case. . . . (T)he ability to produce rebuttal experts, equally conversant with the mechanics and methods of a particular technique, may prove to be essential.' "

I assume that they mean there should be qualified persons who can take issue with an expert's conclusion that a given

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exemplar is or is not the voice of the accused. (It must be remembered that this technique works both ways. It may clear an individual as well as convict him.) Such a minimal reserve obviously is available, as witness the list in the "Voiceprint' Defense Package" of the Practising Law Institute for its Spring-1974 workshop on advanced criminal defense techniques. They surely cannot mean a "minimal reserve of experts" prepared to joust on the issue of the validity of the technique itself. They have demonstrated that there are opponents to its validity, but carrying forward that philosophy would impede the introduction today of fingerprint or ballistics evidence because it is probable that a "minimal reserve of experts" is not available to testify in opposition to the use of such evidence as differentiated from testimony on the issue of whether the expert has drawn a correct conclusion from that which he has observed.

6. The appropriate standard

In the wake of the New Mexico Supreme Court's approval of the admission of polygraph evidence in *State v. Dorsey*, 88 N.M. 184, 539 P.2d 204 (1975), Professor Romero reviewed the standards for admitting scientific evidence under that state's new rules, noting, "The New Mexico and the Federal Rules of Evidence are essentially identical as they relate to scientific evidence." Romero, *The Admissibility of Scientific Evidence Under the New Mexico and Federal Rules of Evidence*, 6 N.M.L.Rev. 187, 188 n. 5 (1976). He began by examining Rules 702 and 703, pertaining to expert testimony. Federal Rule 702 provides:

"Testimony by Experts

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

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The Advisory Committee's Note includes this comment:

"Whether the situation is a proper one for the use of expert testimony is to be determined on the basis of assisting the trier. . . . When opinions are excluded, it is because they are unhelpful and therefore superfluous and a waste of time. 7 Wigmore § 1918."

Regarding this rule, it is said in 11 Moore's Federal Practice § 702.02 (2d ed. 1976):

"Since the finder of fact may give undue weight to expert testimony, 'because of its aura of special reliability and trustworthiness,' the rule continues the existing federal practice of limiting expert testimony by two standards.

"Under this test the testimony of expert witnesses is acceptable where (1) the witness is properly qualified by his knowledge and where (2) his testimony will 'assist the trier of fact to understand the evidence or to determine a fact in issue.'" (Footnotes omitted.)

Referring to "the possibility that triers of fact may attach special significance to the testimony of an expert," it is said, "this seems unlikely where there are opposing experts." Id. at § 702.10 n. 4.

It will be noted that there is nothing in the rule which requires if the expert testimony is of a scientific character, that its underlying theories must be generally accepted by the scientific community. But [391 A.2d 426] Romero points out, "By requiring that scientific evidence 'assist the trier of fact,' Rule 702 implicitly requires that the scientific or specialized knowledge that is the subject of expert opinion be Reliable." Romero, *Supra*, 6 N.M.L.Rev. at 197 (emphasis added). This, he says, "is a question of relevancy to which Rule 401 is addressed." Id. at 198.

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Federal Rule 401 provides:

"Definition of 'Relevant Evidence'

" 'Relevant evidence' means evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence."

Romero says, "Whether scientific evidence has any probative value, or, in the terms of Rule 401, any tendency to prove credibility (in the case of polygraph evidence), is the critical question." 6 N.M.L.Rev. at 201. Pointing out that this determination will turn on the reliability of the evidence, Romero continues:

"Reliability, however, is not a constant. It varies in degree ranging from minimal reliability to perfect reliability. . . . It is important, therefore, to determine to what degree the reliability of scientific evidence, in the sense that the underlying principles are valid, must be established before it is relevant and admissible." Id. at 203 (footnote omitted).

He concludes that the appropriate standard would be to require "foundation evidence tending to show that the scientific evidence is in Some degree reliable." Id. at 204 (emphasis added) (footnote omitted). "Beyond this threshold, showing the degree of reliability would, of course, be a matter of weight for the jury." Id. at 204 (footnote omitted).

Romero concludes:

"In summary, the theory of admissibility for scientific evidence under the New Mexico and Federal Rules of Evidence is one of relevancy. First, scientific evidence must be relevant in order to be admissible under Rule 402. Second, there must be evidence tending to show that the scientific evidence is reliable in order to be relevant under Rule 401.

"It is submitted that the theory of admissibility embodied in the New Mexico and Federal Rules of

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Evidence is correct in its treatment of scientific evidence. Scientific evidence ought to be held to the same standard of relevancy as is nonscientific evidence. Although considerations of undue prejudice, confusion of the issues, or jury competence to deal with scientific issues may affect the decision to admit scientific evidence, these considerations do not and should not affect the theory of admissibility one of logical relevancy. These considerations may, however, operate under Rule 403 to exclude relevant evidence, scientific or otherwise, whose probative value is substantially outweighed by these considerations." Id. at 204-05 (footnotes omitted).

It is obvious that the Federal Rules make no "express reference to a standard of general scientific acceptance." Id. at 206. The Maine court in *State v. Williams*, *supra*, said that the Maine Rules of Evidence (modeled on the Federal Rules) "do not purport to establish a special standard to govern the admissibility of testimony involving newly ascertained, or applied, scientific principles." Referring to the Federal Rules, Professor Romero points out that "probative value, can be established without demonstrating general scientific acceptance." 6 N.M.L.Rev. at 206. "Thus, a requirement of general scientific acceptance would appear to impose a more stringent condition for

establishing relevancy a condition that is inconsistent with Rule 401. . . . (E)vidence contesting the reliability of the results would merely affect the weight to be given the evidence." Id. at 206-07 (footnotes omitted).

Although no reference was made to Professor Romero's view, support for it is found in *State v. Williams*, 388 A.2d 500, where the Supreme Judicial Court of Maine said that the defendant relied on the fact that the Rules of Evidence of that state "do not deal Specifically with the admissibility problem as it may arise by virtue of newness[391 A.2d 427] in the development, or application, of scientific principles." (Emphasis in original.) It said that the court was asked:

"to fill this gap by establishing an additional precondition of admissibility as applicable Specially

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to the situation in which proffered expert testimony will rest on a new ascertainment, or new application, of scientific principles this further condition to be that there must be 'general acceptance' of such newly discovered scientific principle, or new application of scientific principle, in the relevant scientific field." Id. At 503 (emphasis in original).

The Maine court "refuse(d) to take th(is) course," saying it "believe(d) (this) would be at odds with the fundamental philosophy of (the Maine) Rules of Evidence, as revealed more particularly in Rules 402 and 702, generally favoring the Admissibility of expert testimony whenever it is relevant and can be of assistance to the trier of fact." (Emphasis in original.)

Applying Romero's analysis to spectrographic voice identification, it would appear that there are sufficient indications of reliability to say that opinions based on the process are relevant. Critics of the technique admit that the process is "in some degree reliable." (Romero's threshold for admissibility.) The Bolt group said: "Under certain laboratory conditions and for some selected sample of the population, the probability of making an error in identification can be stated. (That rate of error is relatively low.) But for the less-than-ideal conditions encountered in forensic situations, the indications are that the probability of error will increase substantially." Bolt, Cooper, David, Denes, Pickett & Stevens, Letter to the editor Speaker identification by speech spectrograms: some further observations, 54 J. Acoustical Soc. of Am. 531, 533-34 (1973). In essence, the critics have said that the reliability of this identification process under ideal conditions has been demonstrated satisfactorily; whether the process would prove as reliable under adverse conditions was something not proven by the Tosi study. The Bolt group's criticism and concerns cannot be read as stating that the process is totally unreliable. The Maine court in *State v. Williams*, 388 A.2d at 504-05, said:

"(N)one of the acoustical scientists who testified questioned as facts that recordings of different

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human voices vary more in time, frequency and intensity than recordings of the same voice and that the spectrograph can accurately plot these variables. The opposition experts focused only on the difficulties of comparison and the exercise of judgment and the failure of the spectrograph experiments to account for many real world variables."

Certainly the limitations on the process should be considered by the trier of fact in determining the proper weight to be given this sort of testimony, but the limitations do not indicate that the spectrograph process is so unreliable that an opinion based on that process is irrelevant.

Professor Romero's view of the standard for admissibility of scientific evidence under the Federal Rules of Evidence, and the standard outlined by the Maine court in *State v. Williams*, 388 A.2d 500, are in accord with the cases discussed under part 2 of this opinion regarding ballistics and other scientific analysis, our prior Maryland cases involving expert testimony, and the standard put forth by Dean McCormick that "(a)ny relevant conclusions which are supported by a qualified expert witness should be received . . ."

7. Conclusion

I conclude that even under the Frye test the trial judge did not abuse his discretion in permitting the opinion testimony based upon spectrographic voice analysis. Given the instructions which he gave the jury, I see no possible basis for believing that jurors would by this testimony in some manner become biased against the accused. I think it obvious that a "minimal reserve of experts" is available. I do not believe that jurors in Montgomery County are any less intelligent or well informed than the juries before whom I have tried cases. I have [391 A.2d 428] come away from jury trials with confidence that juries as a whole arrive at substantial justice. I concur 100% In the statement of Chief Judge Marbury for the Court in *Shanks*, 185 Md. at 449, 45 A.2d at 90: "Judges and juries must be presumed to have average intelligence at least, and no

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assumption to the contrary can be made for the purpose of excluding otherwise admissible testimony."

As I indicated at the outset, the majority opinion rests upon a rule criticized by eminent scholars, a rule which has never been adopted in Maryland. It not only is out of step with our prior decisions, it fails to apply the standards which respected courts have applied in the matter of opinion evidence concerning fingerprints, ballistics, and X-rays. It is out of step with the majority of reported opinions in the particular field with which we are here concerned, the most recent of which (*State v. Williams*, 388 A.2d 500 (Me.1978)) was decided only about two months ago.

We would do well to keep before us the observation of Judge W. Mitchell Digges for the Court in *Produce Exchange v. Express Co.*, 147 Md. 424, 446, 128 A. 403 (1925):

"This Court in many instances has commented upon the inherent weakness of expert testimony, because of the fact that at best it is only an expression of opinion by the witness, and is in a measure usurping the function of the jury; yet in proper cases, when a witness has qualified by demonstrating to the court his peculiar knowledge of the question to be decided by the jury, and of which the average man would not have knowledge, this class of testimony has uniformly been allowed. The jury understands that the expert's testimony is not as to a fact, but simply his opinion as to the probable result flowing from facts which the jury might determine have been proven in the case. The opinion of the expert witness has probative force by reason of his unusual and expert knowledge of the subject, gained from study, experience, and observation. The worth of such testimony is based upon the logical inference that, if the witness' experience and observation have demonstrated that certain circumstances under certain conditions did produce a certain result, like circumstances under like conditions in other cases would produce a similar result. Having decided that this witness properly

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qualified as an expert, and that the questions propounded to him were proper hypothetical questions, the weight to be given to his answers was a question for the jury, with which this Court has no concern." *Id.* at 446-47, 128 A. at 412.

We likewise would do well to keep before us the view expressed by one of the "greats" in the field of evidence prior to Wigmore and McCormick in *J. Thayer, Evidence* (1898):

"(T)here is ground for saying that, in the main, any rule excluding opinion evidence is limited to cases where, in the judgment of the court, it will not be helpful to the jury. Whether accepted in terms or not, this view largely governs the administration of the rule. It is obvious that such a principle must allow a very great range of permissible difference in judgment; and that conclusions of that character ought not, usually, to be regarded as subject to review by higher courts. Unluckily the matter is often treated by the courts with much too heavy a hand; and the quantity of decisions on the subject is most unreasonably swollen." *Id.* at 525.

I realize that the majority has purported to leave the way open for admission of testimony such as this at some time in the future. As a practical matter, however, what trial judge in his right mind would be so bold at any time in the future as to permit the introduction of such testimony when the Court has today rejected the very thoughtful and thoroughgoing analysis by Judge McAuliffe in this case as well as the equally thoughtful and thorough analysis by Chief Judge Gilbert for the Court of Special Appeals?

I am authorized to say that MURPHY, C. J., and ORTH, J., concur in the views here expressed.

1 No comparison was attempted on the remaining three calls. One call was too short, one too distorted, and no voice exemplar had been secured for a third.

2 Our grant of certiorari also encompassed Reed's alternate argument that the Best Evidence Rule was violated when the trial court permitted either a second or a third-hand copy of the tapes of the September 1974 calls to be used for comparison with Reed's voice exemplars. Reed maintains that the original tapes were destroyed through gross negligence of the investigating police officers, and that the second copy was lost or destroyed without explanation. However, in light of our ruling on Reed's principal claim, it is unnecessary for us to reach this alternate issue.

3 See, e. g., *United States v. Baller*, 519 F.2d 463 (4th Cir. 1975), Cert. denied, 423 U.S. 1019, 96 S.Ct. 456, 46 L.Ed.2d 391 (1975); *United States v. Franks*, 511 F.2d 25 (6th Cir. 1975), Cert. denied, 422 U.S. 1042, 95 S.Ct. 2654, 45 L.Ed.2d 693 (1975); *United States v. Addison*, 162 U.S.App.D.C. 199, 498 F.2d 741 (1974); *People v. Kelly*, 17 Cal.3d 24, 130 Cal.Rptr. 144, 549 P.2d 1240 (1976); *Commonwealth v. Lykus*, 367 Mass. 191, 327 N.E.2d 671 (1975); *State ex rel. Trimble v. Hedman*, 291 Minn. 442, 192 N.W.2d 432 (1971); *Commonwealth v. Topa*, 471 Pa. 223, 369 A.2d 1277 (1977). See also Comment, *The Voiceprint Dilemma: Should Voices Be Seen and Not Heard?*, 35 Md.L.Rev. 267 (1975); Decker and Handler, *Voiceprint Identification Evidence Out of the Frye Pan and into Admissibility*, 26 Am.U.L.Rev. 314 (1977); Greene, *Voiceprint Identification: The Case in Favor of Admissibility*, 13 Am.Crim.L.Rev. 171 (1975); Jones, *Danger Voiceprints Ahead*, 11 Am.Crim.L.Rev. 549 (1973); Jones, *Evidence Vel Non The Non Sense of Voiceprint Identification*, 62 Ky.L.J. 301 (1974); Kamine, *The*

Voiceprint Technique: Its Structure and Reliability, 6 San Diego L.Rev. 213 (1969); Hollien and McGlone, The Effect of Disguise on "Voiceprint" Identification, 2 J. of Crim.Def. 117 (1976).

4 Dr. Tosi is Professor of Audiology and Speech Sciences and Physics at Michigan State University. He holds two Ph.D.'s, one in Audiology and Speech Sciences from Ohio State University, the other in Engineering and Physics from Buenos Aires University. He is a member of various professional societies and has published several books and numerous papers.

5 Sergeant Smrkovski has been employed by the Michigan Department of State Police for ten years, the last four and one-half as officer in charge of the voice identification unit. At the time of the hearing, he was about to receive his bachelor's degree in audiology and speech science from Michigan State University.

6 See, in addition, Wigmore, *The Science of Judicial Proof* § 220, p. 450 (3d ed. 1937):

"But, since the additions thus made possible to our unaided senses are due to the use of instruments constructed on knowledge of scientific laws, it is plain that the correctness of the data thus obtainable must depend upon the correctness of the instrument in construction and the ability of the technical witness to use it. Hence, the following three fundamental propositions apply to testimony based on the use of all such instruments:

A. The type of apparatus purporting to be constructed on scientific principles must be accepted as dependable for the proposed purpose by the profession concerned in that branch of science or its related art. This can be evidenced by qualified expert testimony; or, if notorious, it will be judicially noticed by the judge without evidence.

B. The particular apparatus used by the witness must be one constructed according to an accepted type and must be in good condition for accurate work. This may be evidenced by a qualified expert.

C. The witness using the apparatus as the source of his testimony must be one qualified for its use by training and experience.

"These fundamentals will in the ordinary case be evidenced readily. But in every branch of science there are charlatans and incompetents. The recognition of the above fundamentals will usually serve to diminish the risk of unreliable testimony."

7 In 1665, in what may be one of the first reported instances of expert testimony, a certain Dr. Brown of Norwich, testifying at a trial, delivered of himself the expert scientific opinion that the accused were witches and, by practicing their witchcraft at the devil's bidding, had bewitched several children. The accused were found guilty and hanged. *A Trial of Witches at Bury St. Edmonds*, 6 *Howell's State Trials* 687, 697 (1665). No issue seems to have been raised in that case concerning the validity of the process for determining whether one was a witch.

8 See, e. g., Highleyman, *The Deceptive Certainty of the "Lie Detector"*, 10 *Hastings L.J.* 47, 63 (1958): "(T)he use of 'lie detector' evidence invites confusion between (1) the reliability of the objective physiological facts which are recorded by the polygraph, and (2) the reliability of the subjective inferences of truth or deception which are drawn from those facts by the examiner."

9 See 2 Wigmore, *Evidence* § 659, p. 771 (1940):

"When the testimony, thus appearing to the ordinary layman to lack a rational basis, is founded on observations made with esoteric methods or apparatus Vacuum-rays, telepathy, and the like this method should be explained by the witness; and, If it is vouched for as accepted in his branch of learning, it suffices to admit his testimony." (Emphasis supplied.)

10 See, e. g., the dissent's observations in *United States v. Wright*, 17 *U.S.C.M.A.* 183, 194, 37 *C.M.R.* 447 (1967):

"The trial was virtually concerned with nothing else but the efficacy and infallibility of the voiceprint process. The court's questions were directed almost completely to its effectiveness and demonstrated the members' extreme interest in its identification of the accused, to the exclusion of all others. Moreover, the trial counsel made the process the focal point of his argument, devoting approximately sixty percent thereof to its reliability."

11 See *State v. Cary*, 56 *N.J.* 16, 264 *A.2d* 209 (1970); *People v. King*, 266 *Cal.App.2d* 437, 72 *Cal.Rptr.* 478 (1968). But see *United States v. Wright*, 17 *U.S.C.M.A.* 183 (1967).

12 O. Tosi, H. Oyer, W. Lashbrook, C. Pedrey, and J. Nicol, *Voice Identification through Acoustic Spectrography*, Speech and Hearing Sci. Lab., Michigan State Univ., Rep. No. 171 (1971); O. Tosi, H. Oyer, W. Lashbrook, C. Pedrey, J. Nicol, and E. Nash, *An Experiment on Voice Identification: Excerpts from Report SHSLR 171*, Dep't of Audiology and Speech Sciences, Michigan State University, East Lansing, Michigan (July 1971); O. Tosi, H. Oyer, W. Lashbrook, C. Pedrey, J. Nicol, and E. Nash, *Experiment on Voice Identification*, 51 *J. Acoustical Soc'y of Am.* 2030 (1972).

13 One of the authors, Kenneth Stevens, was apparently also a consultant in the Tosi experiment, Tosi, et al., *Experiment on Voice Identification*, supra, at 2043.

14 Tosi included in this group of supporters Dr. Peter Ladefoged. Ladefoged was originally an opponent of the voiceprint process (See Ladefoged and Vanderslice, *The "Voiceprint" Mystique*, 7 *Working Papers in Phonetics* 126 (1967)). Ladefoged testified in *United States v. Raymond*, 337 *F.Supp.* 641 (D.D.C. 1972), where voiceprint

testimony was admitted. This result was overturned in *United States v. Addison*, 162 U.S.App.D.C. 199, 203, 498 F.2d 741, 745 (1974), where Judge McGowan, speaking for the court, observed that:

"(V)iewed in its entirety, Dr. Ladefoged's letter, as he himself characterized it . . . simply reflects a position 'of abatement of skepticism towards voiceprint,' not one of complete acceptance."

In addition, in *Jones*, *Evidence Vel Non The Non Sense of Voiceprint Identification*, 62 Ky.L.J. 301, 322 n. 96, Ladefoged is reported as responding to the question, "Would you say that 'voiceprints' as a method of voice identification now has general acceptance in the scientific community?" as follows:

"I think I did say that in some case; probably in the Washington case (I. e., *United States v. Raymond*) I said that. I think now I was in error to say that because, having said that, numerous of my friends, have said, 'No, not true.' I said it in good faith thinking that my friends had accepted it, and I now find that I have been reprimanded by some people."

15 Dr. Baker, who received his Ph.D. in Hearing and Speech Science from Ohio State University, is presently teaching graduate and undergraduate courses in hearing and speech at the University of Maryland. Dr. Baker testified that he had done research in related areas of spectrography and was familiar with the scientific literature concerning voice identification by spectrography.

16 Dr. Hollien holds advanced degrees including a Ph.D. from the University of Iowa. He is a professor of speech at the University of Florida and is director of the Institute for Advanced Study of Human Communication. He is the head of the Institute's research program on speaker identification. He is a member of various societies, including the Academy for the Forensic Application of the Communications Sciences, of which he is a council member. He has authored over 100 major publications.

1 I think Professor Wigmore is generally regarded as the outstanding authority, during his lifetime at least, in the field of evidence. I thus find it of interest that the only reference to Frye found in Wigmore, *Evidence* (3d ed. 1940), produced during Professor Wigmore's lifetime, is in a footnote to § 999 at p. 645 of Vol. 3. It states, "The use of the instrument (polygraph, cardiograph, pneumograph) when offered through expert testimony On behalf of an accused, has twice been rejected, in reported cases," referring to Frye and another case. (Emphasis in original.) The section is concerned with "Scientific Psychological Diagnosis of Testimony" and "the Blood-Pressure ('Lie-Detector') Method." The paragraph to which the footnote is appended states:

"Thirdly, the fact of the lie might be used in Evidence at the trial, as a basis for inference as to lies on other details of testimony precisely as we infer from lies disclosed by the traditional method (Post, § 1001). But this use of the machine-registered lie is rarely desirable and has not yet been judicially sanctioned by a Supreme Court." *Id.* at 645 (emphasis in original).

To place the matter in context, the subtitle under which the above appears is "Testimonial Impeachment."

Nowhere in this work, insofar as I can ascertain, does Professor Wigmore ever advocate a test relative to the admissibility of scientific evidence as rigid as that enunciated in Frye and adopted by the Court today.

We are informed that the experiments which produced the techniques used in the case at bar began at Bell Telephone Laboratories during World War II. I find it of interest to note, however, that Professor Wigmore apparently foresaw such a technique, because in *The Science of Judicial Proof* § 156 (3d ed. 1937) he states:

"Vocal Traits. By means of a well-understood principle, having many applications, the vibrations of the spoken voice on a diaphragm may be accurately translated, through an electrical current, into oscillations of a needle, and these oscillations may be arranged to leave a continuous variable ink-tracing as a record. It was long ago demonstrated that the vocal chords of a singer, in uttering the sustained notes of a song, have individuality, so that two such records of the same aria by different singers differ noticeably. Moreover the spoken voice, though its notes change their wave-lengths with far greater rapidity than the singing voice, can now also be made to leave a similar record having minute differences of individuality. The instrument available for this is a form of oscillograph. If now it can be proved that this individuality of the vocal organ (like the fingerprint) endures through a period of years, it is obvious that an additional mode of identification, readily recorded and classified, has become practicable." *Id.* at 284-85 (footnotes omitted).

Note that for identification purposes Professor Wigmore was speaking in terms of comparisons of voice wave-lengths from records made years apart. No such lapse of time exists in the case at bar.

2 In other words, the appellate court merely affirmed the trial judge's exercise of discretion in excluding the evidence.

3 C. McCormick, *Law of Evidence* § 170 at 363-64 (1954), contains a statement almost identical to that above quoted.

4 The article in question was prepared for the Seminar on the Administration of Criminal Justice at Harvard Law School.

5 It is noteworthy that Kaplan, *The Lie Detector: An Analysis of Its Place in the Law of Evidence*, 10 *Wayne L.Rev.* 381, 392 (1964), after mentioning the Frye test as applied in certain cases which had considered lie detector evidence said, "In each case, the court used the strict standard normally reserved for taking judicial notice. In no case did the court then inquire to see whether the evidence fulfilled the requirements established for the admission of the great bulk of evidence which is not judicially noticed."

6 It is probably not accurate to state that fingerprints are an "infallible" method of identification. The process of identifying prints is basically one of matching similarities. A positive identification "requires that a minimum of eight identical ridge characteristics must be found in both prints, though most experts prefer at least 10-12 concordances." A. Moenssens et al., *Scientific Evidence in Criminal Cases* § 708 at 324 (1973). Obviously, the greater the number of points of similarity, the more conclusive the identification will be. This Court, however, has approved admissibility of fingerprint evidence based on only Five matching characteristics, noting that the lack of conclusiveness "goes to the weight rather than to the admissibility of the evidence." *Breeding v. State*, 220 Md. 193, 198, 199, 151 A.2d 743, 747 (1959). For an interesting account of a case in which a positive identification was demonstrated to be incorrect, see *Lauritis, Some Fingerprints Lie*, 34 *NLADA Briefcase* 74 (1977). In spite of fourteen points of similarity, the defense expert found three points of dissimilarity, proving that the prints could not be identical.

It also should be noted that "the use of 'planted' or forged fingerprints is theoretically within the realm of possibilities, (although) in practice no such actual cases have been discovered." Moenssens et al., *Supra*, § 7.16 at 346, citing Moenssens, *Fingerprint Techniques* 284-293 (1971). A technique for such forgeries is outlined in Inbau, *Scientific Evidence in Criminal Cases (III)*, 25 *J.Crim.L. & C.* 500, 504 n. 9 (1934).

7 Regarding judicial notice, See generally Morgan, *Judicial Notice*, 57 *Harv.L.Rev.* 269 (1944).

8 Strong, *Questions Affecting the Admissibility of Scientific Evidence*, 1970 *U.Ill.L.F.* 1 (1970), states:

"The liberality with which expert testimony is today received is frequently asserted to be justified by the fact that it would not be proper for judges, in their ignorance concerning the principles of other disciplines, to undertake to assess the validity or invalidity of those principles, and to decline to hear the testimony of those versed in such principles. No doubt this liberalism is to some extent attributable to a consciousness of the mortification which has ultimately befallen many courts in the past which have undertaken to declare that certain scientific theories presented to them were so much witchcraft. 31

"(Note 31:) See, e. g., *People v. Berkman*, 307 Ill. 492, 501, 139 N.E. 91, 94 (1923), in which the court characterized offered testimony concerning ballistics as 'preposterous,' a denunciation tacitly withdrawn only seven years later in *People v. Fisher*, 340 Ill. 216, 172 N.E. 743 (1930)." *Id.* at 10 (footnote 30 omitted).

9 The majority opinion makes reference in footnote 7 to a 1665 witch trial at which a doctor expressed the expert opinion that the victims had been bewitched by the defendants. The implication is that courts have been too hasty to accept theories which purport to be based on science.

A more famous example supporting the opposite view is the conviction of Galileo for his teaching that the earth is not the center of the universe. Brought before the Roman Inquisition in 1633, Galileo was found "guilty of having 'held and taught' the Copernican doctrine and was ordered to recant. (He) recited a formula in which he 'abjured, cursed and detested' his past errors. The sentence carried imprisonment, but this portion of the penalty was immediately commuted by the Pope into house arrest and seclusion The sentence of house arrest remained in effect throughout the last eight years of his life." 7 *Encyclopaedia Britannica*, Galileo 851, 853 (15th ed. 1974).

10 Those who find it highly "suspicious" that Dr. Oscar Tosi has testified in most of the voiceprint cases might be interested to learn that Colonel Calvin Goddard, who played a primary role in the development of ballistics as a science, See Inbau, *Scientific Evidence in Criminal Cases (I)*, 24 *J.Crim.L. & C.* 825, 829 n. 11 (1934), was a key witness in many of the early ballistic cases. See, e. g., *People v. Fisher*, 340 Ill. 216, 172 N.E. 743 (1930); *State v. Campbell*, 213 Iowa 677, 239 N.W. 715 (1931); *Evans v. Commonwealth*, 230 Ky. 411, 19 S.W.2d 1091 (1929); *State v. Boccadoro*, 105 N.J.L. 352, 144 A. 612 (1929); and *Galenis v. State*, 198 Wis. 313, 223 N.W. 790 (1929). (Inbau notes that Colonel Goddard testified in this case, 24 *J.Crim.L. & C.* at 837 n. 35.) In *People v. Fisher* the court noted that Goddard "had been consulted as an expert in homicide cases in more than one-half the States in this country and had testified to his findings in a large percentage of cases." 340 Ill. 237-38, 172 N.E. at 753.

11 In *State v. Damm*, 62 S.D. 123, 252 N.W. 7 (1933), the defendant in a rape case asked the trial court to require the prosecutrix (his foster daughter) to undergo a blood test. He hoped that this would prove that he was not the father of her illegitimate child. The request was denied. The Supreme Court affirmed, saying there was no abuse of discretion:

"We base such holding specifically upon the proposition that it does not sufficiently appear from the record in this case that modern medical science is agreed upon the transmissibility of blood characteristics to such an extent that it can be accepted as an unquestioned scientific fact that, if the blood groupings of the parents are known, the blood

group of the offspring can be necessarily determined, or that, if the blood groupings of the mother and child are known, it can be accepted as a positively established scientific fact that the blood group of the father could not have been a certain specific characteristic group. In other words, we think it insufficiently appears that the validity of the proposed test meets with such generally accepted recognition as a scientific fact among medical men as to say that it constituted an abuse of discretion for a court of justice to refuse to take cognizance thereof, as would undoubtedly be the case if a court today should refuse to take cognizance of the accepted scientific fact that the finger prints of no two individuals are in all respects identical. We therefore find no error here." *Id.* at 136-37, 252 N.W. at 12.

In a later opinion, *State v. Damm*, 64 S.D. 309, 266 N.W. 667 (1936), the court discussed blood tests once again. It said:

"In view of the fact that our opinion seems generally to have been interpreted as passing upon the broader and more abstract question of the existence of reliability as a matter of established scientific fact; in view of the novelty and importance of the matter; and particularly in view of the fact that we do not wish any misapprehension as to the views of this court by any possibility to deter other courts from accepting and acting upon a tenet of biological science which we are convinced is now fully ripe for acceptance in medicolegal cases, we deem it proper at this time to state, for whatever it may be worth, our actual opinion on the abstract question, notwithstanding the fact (as will more fully hereinafter appear) that it is also our view that the determination of the abstract question favorably to appellant's contentions is not decisive of the present appeal.

"We therefore say, without further elaboration or discussion, that it is our considered opinion that the reliability of the blood test is definitely, and indeed unanimously, established as a matter of expert scientific opinion entertained by authorities in the field, and we think the time has undoubtedly arrived when the results of such tests, made by competent persons and properly offered in evidence, should be deemed admissible in a court of justice whenever paternity is in issue." *Id.* at 312, 266 N.W. at 668.

In other words, the court took judicial notice of the indisputable reliability of the tests.

12 Note, *Evolving Methods of Scientific Proof*, 13 N.Y.L.F. 679, 759 (1968), describes this case as "the first adjudication of the test results in a criminal prosecution" In the light of *State v. Damm*, *supra* n. 11, what obviously is meant is that *Shanks* is the first named case in which blood test results were used against the defendant to show commission of the particular crime.

13 A very few reported cases have favored admissibility of polygraph evidence. See, e. g., *United States v. Ridling*, 350 F.Supp. 90 (E.D.Mich.1972); *Commonwealth v. Juvenile*, 365 Mass. 421, 313 N.E.2d 120 (1974); and *State v. Dorsey*, 88 N.M. 184, 539 P.2d 204 (1975). The decision to admit polygraph evidence in *United States v. Zeiger*, 350 F.Supp. 685 (D.D.C.1972), was reversed summarily on appeal, 155 U.S.App.D.C. 11, 475 F.2d 1280 (1972).

14 Although one frequently cited justification for the exclusionary effect of the *Frye* rule is that fairness requires general acceptance of a scientific technique before it is used against a litigant, many of the lie detector cases have involved the attempts of a defendant to use favorable results to prove his innocence. Such cases cited by Moenssens et al. at § 14.10 include *State v. Bohner*, 210 Wis. 651, 246 N.W. 314 (1933); *People v. Becker*, 300 Mich. 562, 2 N.W.2d 503 (1942); *State v. Cole*, 354 Mo. 181, 188 S.W.2d 43, 189 S.W.2d 541 (1945); *Boeche v. State*, 151 Neb. 368, 37 N.W.2d 593 (1949); *State v. Pusch*, 77 N.D. 860, 46 N.W.2d 508 (1950); *Henderson v. State*, 94 Okl.Cr. 45, 230 P.2d 495, Cert. denied, 342 U.S. 898, 72 S.Ct. 234, 96 L.Ed. 673 (1951); *Peterson v. State*, 157 Tex.Cr.R. 255, 247 S.W.2d 110, Reh. denied, 157 Tex.Cr.R. 255, 248 S.W.2d 130 (1952); *People v. Davis*, 343 Mich. 348, 72 N.W.2d 269 (1955); and *People v. Hudson*, 38 Ill.2d 616, 233 N.E.2d 403 (1968) (defendant sought to introduce inconclusive results).

15 One psychologist noted that the lack of official recognition of a scientific technique by professional groups is not necessarily indicative of disapproval: "scientific bodies rarely take a stand on a test." *Burack, A Critical Analysis of the Theory, Method, and Limitations of the "Lie Detector,"* 46 J.Crim.L., C. & P.S. 414, 423 (1955).

16 *Greene, Voiceprint Identification: The Case in Favor of Admissibility*, 13 Am.Crim.L.Rev. 171, 171-72 (1975), states that "the sound spectrograph has been utilized by acoustical scientists and technicians for the better part of the 20th century to analyze and classify human speech sounds" To the same effect see *State v. Williams*, 388 A.2d 500 (Me.1978).

17 The lone expert produced by the defense to oppose the admissibility of this evidence, Dr. Joseph Baker of the University of Maryland, apparently would not have approved of the holding of the Court in *McGuire v. State*, 200 Md. 601, 92 A.2d 582 (1952), because, as we shall later point out, he was of the opinion that listening alone is not a valid way of making a voice identification.

18 The agreed statement of facts here says:

"On or about September 20, 1974, the Appellant was placed in a lineup at the Montgomery County Detention Center. The prosecutrix was unable visually to recognize anyone, but after hearing the participants in the lineup speak, she identified with 85-90% Certainty the Appellant as being the person who raped and called her. Sergeant

Lennon and Sergeant Evans, both of the Montgomery County Police Department, also identified Appellant as the speaker on the composite copy tape based on their personal contact with Appellant after his arrest. The jury was permitted to listen to both the composite copy tape and the Appellant's voice exemplars.

"On December 6, 1975, while confined in the Montgomery County Detention Center, Appellant telephoned the prosecutrix and she identified the voice as that of Appellant."

19 Lest it be said that I have omitted from this list *D'Arc v. D'Arc*, 157 N.J.Super. 553, 385 A.2d 278 (Ch.Div.1978), and *Brown v. United States*, 384 A.2d 647 (D.C.App.1978), I hasten to point out that *D'Arc* is Not an appellate opinion, but one of the Chancery Division of the Superior Court. In *Brown* the court said:

"While the greater number of appellate opinions favor the admissibility of such evidence, the recent opinions (cited above) denying admission indicate the absence of a clear trend. Cogent reasons, enunciated by members of well-respected courts, are available on both sides. In view of the continuing debate on this subject, and in light of the state of this record on the issue of reliability of this particular voice sample, we decline to adopt the trial court's ruling that voice spectrographic identification evidence was shown to be sufficiently reliable and accepted within the scientific community to permit its introduction in this criminal case. If error, however, the error was harmless." *Id.* at 650.

I thus have difficulty in agreeing with the majority when they listed this case among those cited for its proposition that "(a)most every state court that has considered voiceprint evidence in a reported opinion has applied the Frye or a similar standard in determining the question of its admissibility."

20 The writer lists each of the cases by court and number, including this case in the Circuit Court for Montgomery County.

21 The majority opinion refers to "the testimony of Dr. Henry Hollien, another expert witness for the defense" It should be specifically noted that Dr. Hollien was not a witness at the preliminary hearing on the issue of the admissibility of the opinion based upon spectrographic analysis. After the State had closed its case on the issue of guilt, Dr. Hollien was produced as a defense witness. His testimony went in no way to the Admissibility of evidence, but was before the jury on the weight to be accorded to this evidence.

22 It should be recalled that spectrographic analysis of sound has many applications other than voice identification. Dr. Baker and Dr. McClung, two other scientists who testified on the admissibility question, had each used the spectrograph in research unrelated to voice identification.

Of course, the analysis of spectra is not anything new to scientists. The study of the electromagnetic spectrum dates back to Sir Isaac Newton. 17 *Encyclopaedia Britannica* (15th ed. 1974), says of Principles of Spectroscopy:

"Spectroscopy is the study of the absorption and emission of light and other radiation, as related to the wave length of the radiation. Light from natural sources (such as the Sun, stars, fireflies, flames, and lightning) and from manmade sources (such as incandescent lamps, arcs, lasers, and fluorescent lamps) is generally composed of many colours. This composite nature of light, discovered in 1666 by the English physical scientist Sir Isaac Newton, is not usually evident to the casual observer, but it can be shown by passing light through a prism or other device that splits it into constituent colours. A display or description of these colours emitted by a source of light is called the spectrum (plural: spectra) of the source

"Spectroscopy is the science that deals with the sources, measurements, analyses, and uses of spectra. It has practical application in almost every technical field, especially for identifying constituents and processes in any source that emits light. With spectroscopic methods, one can analyze in the laboratory, for example, the composition of a small amount of material with an accuracy and speed that cannot be achieved by chemical processes. Samples can be compared to test their identity. A continuous flow of products can be monitored for variations or pollutants. Apparatus to measure temperatures in controlled thermonuclear fusion (the uniting of certain atoms so that part of their mass is converted to energy) is another special application of spectroscopy. Still another type

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of spectroscopic observation makes possible detailed studies of atomic and molecular structures. In astronomy, solar magnetic storms can be predicted and the chemical constitution of stars can be analyzed by spectroscopy." *Id.* at 455.

23 In *State v. Cary*, 99 N.J.Super. 323, 239 A.2d 680, 683 (1968), upon remand the trial judge said that Dr. Tosi "was of the opinion that the technique has considerable potential as an aid to law enforcement, but before he would give a firm scientific opinion he felt that further experimentation and testing was required because of its infancy in the related scientific fields."

24 Dr. Tosi listed the following scientists as favoring the process of voice identification by sound spectrography: Dr. Peter Ladefoged, Dr. John W. Black, Dr. Henry Truby, Dr. Pac, Dr. Michael Hecker, Dr. Peter Jansen, Dr. John Caling, Philip Serrola, Malcolm Hall, Dr. Leo Deal, Dr. Ora, Dr. William Lashbrook, and Dr. Charles Pedrey, in addition to Lawrence Kersta and Ernest Nash. The opponents he named were: Dr. Fausto Poza, Dr. Henry Hollien,

and Dr. Louis Gerstman. He regarded "the Bolt group" as not really being active in the field of spectrographic voice identification, stating, "(w)ith the exception of a very small experiment conducted in 1967, I think, by Stevens, none of them ever conducted an experiment in voice identification."

25 The Michigan court in *People v. Tobey*, 401 Mich. 141, 257 N.W.2d 537, 539-40 (1977), made much of the fact that the research relative to which testimony was given was primarily the work of either Tosi, Kersta, or Nash. Thus, it is important to note that Dr. McClung did not study under any of them.

26 The case was originally argued before six judges at a time between the announcement of the retirement of Judge Singley and the appointment of Judge Cole.

27 The text of the relevant portion of the order is:

"ORDERED that upon reargument the parties are to include consideration of the following questions:

"1. Should this Court adopt the standard enunciated in *Frye v. United States*, (54 App.D.C. 46), 293 F. 1013 (D.C.Cir. 1923), relative to admissibility of evidence concerning validity of scientific instruments or processes;

"2. If the Frye test is adopted, what persons are to be considered in determining whether a technique has general scientific acceptance, those 'who would be expected to be familiar with its use' as held in *Commonwealth v. Lykus*, 367 Mass. 191, 203, 327 N.E.2d 671, 677 (1975), or some broader based group;

"3. If the answer to (1) above is 'yes,' is whether or not a given technique meets the Frye test a question of fact;

"4. If the answer to (3) above is 'yes,' by whom is the determination to be made;

"5. If the answer to (4) above is the 'trial judge,' then what is the basis for review of his decision, the clearly erroneous standard, abuse of discretion, or some other test;

"6. If the answer to (1) above is 'no,' then what standard should be used, that set forth in *McCormick's Handbook of the Law of Evidence*, § 203 at 491 (2d ed. 1972) ('Any relevant conclusions which are supported by a qualified expert witness should be received unless there are other reasons for exclusion. '), that stated by Thayer, *Evidence* 525 (1898) (whether in the judgment of the court, it will be helpful to the jury), or some other test?"

28 Critics who fear that scientific evidence has too great an impact on a jury to be admissible unless very highly reliable should recall that eyewitness identifications are certainly very impressive to a jury, also. It has been said, "The unreliability of eyewitness identification evidence poses one of the most serious problems in the administration of criminal justice." Note, *Did Your Eyes Deceive You? Expert Psychological Testimony on the Unreliability of Eyewitness Identification*, 29 *Stan.L.Rev.* 969 (1977). The remedy proposed by the aforementioned note was not exclusion of such testimony, but rather permitting opposing testimony by psychologists as to the unreliability of eyewitness reports.