

746 So.2d 355 (1998)

Ex parte State of Alabama.

Re Andre Dwight TURNER

v.

STATE.

1952024.

Supreme Court of Alabama.

January 16, 1998.

Rehearing Denied June 19, 1998.

356 *356 Bill Pryor, atty. gen., and Frances R. Clement, asst. atty. gen., for petitioner.

W. Lloyd Copeland of Clark, Deen & Copeland, P.C., Mobile, for respondent.

SEE, Justice.

This case concerns the admissibility of deoxyribonucleic acid ("DNA") evidence under Ala.Code 1975, § 36-18-30. The trial court held that DNA evidence was admissible to show that Andre Dwight **Turner** was connected to a murder scene. The jury convicted him of two counts of capital murder. The trial court sentenced **Turner** to life in prison without parole. The Court of Criminal Appeals reversed the judgment of conviction, *Turner v. State*, 746 So.2d 352 (Ala.Crim.App.1996), holding that the **State** had failed to satisfy the standard set forth in *Ex parte Perry*, 586 So.2d 242 (Ala.1991), for the admissibility of its DNA evidence. We granted certiorari review to determine whether §§ 36-18-20 to -30, Ala.Code 1975, which were added to the Code in 1994, supersede the *Perry* standard. Because we hold that they do, we reverse and remand.

In 1992, the police found Ms. Ollie and her nephew, L.C., brutally stabbed to death in their home. Ms. Ollie had suffered 34 stab wounds from a butcher knife. L.C. had suffered 15. Police officers, who were observing a group of people standing in front of the home, noticed **Turner** washing his hand in a nearby puddle of water. When the officers approached him, they noticed that the puddle was bloody and that **Turner** had a cut on his hand. They arrested him.

At **Turner's** trial, the **State** offered DNA evidence to show that the DNA in blood samples recovered from the house occupied by Ms. Ollie and L.C. was consistent with **Turner's** DNA. The trial court held a hearing, without the jury, to
357 determine the admissibility of the DNA evidence. At the hearing, Elaine Scott, a forensic serologist *357 with the Alabama Department of Forensic Sciences, testified regarding: (1) DNA matching evidence; and (2) DNA population frequency statistical evidence. DNA matching evidence shows that one sample of DNA "matches," or resembles, another sample of DNA within a permissible range of error. DNA population frequency statistical evidence concerns the frequency with which a given DNA pattern might occur in a given population.^[1] The trial court admitted both types of evidence.

At trial, Scott testified: (1) that the DNA samples taken from the murder scene matched **Turner's** DNA; and (2) that the odds of finding **Turner's** particular DNA profile are 1 in 42,410,000 in the black population and 1 in 179,700,000 in the white population. The jury convicted **Turner** of two counts of capital murder.

In the Court of Criminal Appeals, **Turner** argued that the DNA population frequency statistical evidence had not met the *Perry* standard of admissibility. The Court of Criminal Appeals, applying the *Perry* standard, held that the DNA evidence was inadmissible because the **State** had failed to show that the generally accepted testing techniques that produced the DNA population frequency statistical evidence were properly performed in this case.

I. The Perry Standard

In the 1991 *Perry* decision, this Court addressed the admissibility of DNA evidence:

"In Alabama, whether novel scientific evidence is admissible is determined normally by using the test established in *Frye v. United States*, 293 F. 1013 (D.C.Cir.1923). In *Frye*, a criminal defendant sought to introduce evidence concerning a systolic blood pressure lie detector test. In affirming the trial court's exclusion of the evidence, the court wrote:"

"Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs."

"293 F. at 1014."

"Other courts have discussed what *Frye* requires to permit the introduction of DNA evidence and whether the *Frye* requirements should be modified somewhat in relation to the admission of DNA evidence. Cf.... *United States v. Two Bulls*, 918 F.2d 56 (8th Cir. 1990)...."

Perry, 586 So.2d at 247-48.

358 This Court noted that in addition to the results of the *Frye* "general acceptance" *358 test, whether error occurred in the performance of the tests in a particular case also was of legitimate concern:

"It is the view of this court that given the complexity of the DNA multi-system identification tests and the powerful impact that they may have on a jury, passing muster under *Frye* alone is insufficient to place this type of evidence before a jury without a preliminary, critical examination of the actual testing procedures performed in a particular case."

Perry, 586 So.2d at 248 (quoting *Castro*, 144 Misc.2d at 959-60, 545 N.Y.S.2d at 987-88 (citations omitted)). This Court then quoted with approval the opinion of the United States Court of Appeals for the Eighth Circuit in *United States v. Two Bulls*, 918 F.2d 56, 61 (8th Cir.1990), which applied the *Frye* general acceptance test, plus a factor dealing with the performance of generally accepted testing techniques on the evidence at issue:

"The trial court is to decide (1) whether the DNA evidence is generally accepted by the scientific community, (2) whether the testing procedures used in this case are generally accepted as reliable if performed properly, [and] (3) *whether the test was performed properly in this case*...."

Perry, 586 So.2d at 249 (quoting *Two Bulls*, 918 F.2d at 61) (emphasis added). This Court embraced the "*Frye*-plus" standard (that is, general acceptance of the type of theory and technique relied upon plus an examination of the performance of the techniques in the particular case), adopting the following three-pronged test for the admission of DNA evidence in Alabama trials:

"I. Is there a theory, generally accepted in the scientific community, that supports the conclusion that DNA forensic testing can produce reliable results?

"II. Are there current techniques that are capable of producing reliable results in DNA identification and that are generally accepted in the scientific community?

"III. In this particular case, did the testing laboratory perform generally accepted scientific techniques without error in the performance or interpretation of the tests?"

Perry, 586 So.2d at 250.

II. The Daubert Standard

In 1993, two years after this Court's *Perry* decision, the Supreme Court of the United States overruled the "austere" *Frye* standard for the admissibility of expert scientific evidence in federal trials. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 113 S.Ct. 2786, 125 L.Ed.2d 469 (1993). In *Daubert*, 509 U.S. at 589, 113 S.Ct. at 2794-95, the Supreme Court concluded that Rule 702, Fed.R.Evid., displaced the *Frye* standard. The Court stated:

"*Frye* made 'general acceptance' the exclusive test for admitting expert scientific testimony. That austere standard, absent from, and incompatible with, the Federal Rules of Evidence, should not be applied in federal trials.

". . . .

"... [U]nder the Rules the trial judge must ensure that any and all scientific testimony or evidence admitted is not only *relevant*, but *reliable*."

Daubert, 509 U.S. at 589, 113 S.Ct. at 2794-95 (emphasis added). Thus, if scientific evidence passes the two-pronged test of *Daubert*—reliability and relevance—it will be admissible and the jury will determine the appropriate weight to give that evidence.

The "reliability" prong of the *Daubert* admissibility test requires the party proffering the scientific evidence to establish that the evidence constitutes "scientific knowledge." *Daubert*, 509 U.S. at 590, 113 S.Ct. at 2795. The evidence need not represent immutable scientific fact, but, rather, it must be derived by use of *359 the "scientific method."^[2] *Id.* The trial court should focus its inquiry on the expert's "principles and methodology, not on the conclusions that they generate." *Id.* at 595, 113 S.Ct. at 2797. Thus, the reliability inquiry should address the "scientific validity"^[3] of the principle asserted, that is, whether the "principle support[s] what it purports to show." *Daubert*, 509 U.S. at 590 n. 9, 113 S.Ct. at 2795 n. 9.

In assessing reliability, trial courts should look to several guiding factors, including: (1) whether the "theory or technique... has been ... tested"; (2) whether the "theory or technique has been subjected to peer review and publication"; (3) whether the technique's "known or potential rate of error ... and ... standards controlling the technique's operation" are acceptable; and (4) whether the theory or technique has gained "general acceptance" in the relevant scientific community. *Id.* at 593-94, 113 S.Ct. at 2796-97.

The "relevance" prong of the *Daubert* admissibility test requires the party proffering the scientific evidence to establish that the evidence "assist[s] the trier of fact to understand the evidence or to determine a fact in issue." *Daubert*, 509 U.S. at 591, 113 S.Ct. at 2796 (quoting Rule 702, Fed.R.Evid.). The trial court should focus on the connection between the proffered scientific evidence and the factual issues. *Id.* at 591-92, 113 S.Ct. at 2795-96. Thus, the relevance inquiry should address the "fit" between what the scientific principles and methods are supposed to show and what must be shown to resolve the factual dispute at trial. *Id.*

In 1994, the Alabama Legislature specifically addressed the admissibility of DNA evidence when it established a **state** DNA data bank. Act No. 94-804, Acts of Alabama 1994. The Legislature made several findings, including:

"(d) That genetic identification technology through DNA testing is generally accepted by the relevant scientific community.

"(e) That the procedures and *techniques* employing the underlying theory of DNA identification [are] capable of producing reliable results and are generally accepted in the relevant scientific community.

"(f) That *genetic identification established through DNA testing and analysis should be admissible as a matter of evidence in all courts of this state* and that *juries, both civil and criminal, should be responsible for assessing the weight, if any, to be given to expert testimony or evidence.*"

Ala.Code 1975, § 36-18-20(d), (e), and (f) (emphasis added). With both of the admissibility standards, *Perry* (*Frye*-plus) and *Daubert* (reliability and relevance), before it, the Legislature chose the more flexible admissibility standard established in *Daubert*:

360 "Expert testimony or evidence relating to the use of genetic markers contained in or derived from DNA for identification purposes shall be admissible and accepted as evidence in all cases arising in all courts of this state, provided, however, the trial court shall be satisfied that the expert testimony or evidence meets the criteria for admissibility *360 as set forth by the United States Supreme Court in Daubert [v. Merrell Dow Pharmaceuticals, Inc.]..."

Ala.Code 1975, § 36-18-30 (emphasis added).

In this case, the Court of Criminal Appeals held that the Legislature's enactment of § 36-18-30 did not affect the three-pronged *Perry* test. 746 So.2d 352, 353 (1996). Specifically, the Court of Criminal Appeals held that the third prong of the *Perry* test, which requires the expert to establish that the generally accepted scientific techniques were performed in the particular case without error, survived the enactment of § 36-18-30. 746 So.2d at 353. We disagree.

First, the Legislature could hardly have been more explicit in choosing between two standards of admissibility: *Perry* (*Frye*-plus—strict general acceptance) or *Daubert* (flexible reliability and relevance). The Legislature chose the *Daubert* standard of admissibility. We view this choice as purposeful and effective. See Belcher v. McKinney, 333 So.2d 136, 140 (Ala.1976) ("we are aided by the presumption that the legislature made an informed judgment"); Gulf Coast Media, Inc. v. Mobile Press Register, Inc., 470 So.2d 1211, 1213 (Ala. 1985) ("It is presumed that the legislature does not use statutory language without any meaning or application."); Clark v. Houston County Comm'n, 507 So.2d 902, 903 (Ala.1987) (stating that a "fundamental rule of statutory construction is to ascertain and give effect to the intent of the legislature in enacting the statute").

Second, *Daubert* itself rejected the *Frye* standard, which was much less strict than *Perry's Frye*-plus standard:

"*Frye* made 'general acceptance' the exclusive test for admitting expert scientific testimony. That austere standard, absent from, and incompatible with, the Federal Rules of Evidence, should not be applied in federal trials."

Daubert, 509 U.S. at 589, 113 S.Ct. at 2794-95 (emphasis added). The Supreme Court also explained that the proper focus at the admissibility stage is on the "principles and methodology, not the conclusions that they generate." *Id.* at 595, 113 S.Ct. at 2797. Once this is determined, the jury is capable of weighing the evidence:

"[Litigants should not] be overly pessimistic about the capabilities of the jury and of the adversary system generally. Vigorous cross-examination, presentation of contrary evidence, and careful instruction of the burden of proof are the traditional and appropriate means of attacking shaky but 'admissible evidence.'"

Daubert, 509 U.S. at 596, 113 S.Ct. at 2798. Unlike Perry, 586 So.2d at 250, *Daubert* does not require the accuracy of the testing in the particular case to be assessed at the admissibility stage.

361 Third, the Eighth Circuit, which authored the *Two Bulls* decision on which this Court relied in *Perry* to establish the *Frye*-plus standard of admissibility, has expressly held that, in light of *Daubert*, *Two Bulls* no longer has any precedential value. Pioneer Hi-Bred Int'l v. Holden Foundation Seeds, Inc., 35 F.3d 1226, 1229 n. 12 (8th Cir.1994).^[4] Moreover, in United States v. Beasley, 102 F.3d 1440, 1446-47 (8th Cir.1996), cert. denied, 520 U.S. 1246, 117 S.Ct. 1856, 137 L.Ed.2d 1058 (1997), the Eighth Circuit held that under *Daubert* the defendant's argument concerning the laboratory's testing of the DNA in his particular case went to the weight of the *361 evidence, not its admissibility. *Id.*, 102 F.3d at 1448.^[5] Under *Daubert*, a party's challenge to the performance of a reliable and relevant scientific technique in a particular case should warrant exclusion of the scientific evidence only if the "reliable methodology was so altered ... as to skew the methodology itself." *Id.* (quoting United States v. Martinez, 3 F.3d 1191, 1198 (8th Cir.1993), cert. denied, 510 U.S. 1062, 114 S.Ct. 734, 126 L.Ed.2d 697 (1994)).

We hold that if the admissibility of DNA evidence is contested, the trial court must hold a hearing, outside the presence of the jury, and, pursuant to § 36-18-30, determine whether the proponent of the evidence sufficiently establishes affirmative answers to these two questions:

I. Are the theory^[6] and the technique (i.e., the principle and the methodology) on which the proffered DNA forensic evidence is based "reliable"?

II. Are the theory and the technique (i.e., the principle and the methodology) on which the proffered DNA evidence is based "relevant" to understanding the evidence or to determining a fact in issue?^[7]

Trial courts should use the flexible *Daubert* analysis in making the "reliability" (scientific validity) assessment. In making that assessment, the courts should employ the following factors: (1) testing; (2) peer review; (3) rate of error; and (4) general acceptance.

Trial courts should make the "relevance" assessment by addressing the "fit" between what the scientific theory and technique are supposed to show and what must be shown to resolve the factual dispute at trial. Whether otherwise reliable testing procedures were performed without error in a particular case goes to the weight of the evidence, not its admissibility. Only if a party challenges the performance of a reliable and relevant technique and shows that the performance was so particularly and critically deficient that it undermined the reliability of the technique, will evidence that is otherwise reliable and relevant be deemed inadmissible.^[8]

362 *362 Of course, once a particular theory or technique has satisfied § 36-18-30, a court may take judicial notice of that theory or technique's reliability. See *Perry*, 586 So.2d at 251; *Beasley*, 102 F.3d at 1448 (holding that reliability of the polymerase chain reaction ("PCR") method of DNA typing would be subject to judicial notice in future cases); *Martinez*, 3 F.3d at 1197 (holding that the reliability of the restriction fragment length polymorphism ("RFLP") procedure was subject to judicial notice). We recognize that the **state** of scientific theories and the techniques for producing DNA evidence is not static, and that the scientific community undoubtedly will produce new theories and techniques regarding DNA. Each new theory and technique will be subject to the test set out above until its reliability warrants judicial notice.

III. Application of the Daubert Standard

In this case, the **State** sought admissibility of: (1) RFLP matching DNA evidence; and (2) DNA population frequency statistical evidence. With respect to DNA matching evidence, the **State's** expert, Ms. Scott, testified that the RFLP technique and the theory upon which it is based are used by the Alabama Department of Forensic Sciences. She further testified that the theory and the technique are generally accepted by the Federal Bureau of Investigation and the relevant scientific community as reliable.^[9] This Court has recognized the reliability of the theory and techniques used in RFLP DNA matching testing. *Perry*, 586 So.2d at 250. Accordingly, we take judicial notice that the DNA matching evidence was reliable. Because the DNA matching evidence was relevant to determining a fact in issue in this case, the trial court correctly held that it was admissible.

With respect to the DNA population frequency statistical evidence, however, the record is unclear as to whether the **State** satisfied the reliability test as to the theory and technique used by the Department of Forensic Sciences. The record is also unclear as to whether the trial court took judicial notice of the reliability of the **State's** DNA population frequency statistical evidence and, if so, the basis for such judicial notice. Accordingly, we cannot determine whether the trial court committed reversible error.^[10]

363 *363 This is a case of first impression regarding the proper tests for admissibility under § 36-18-30. Only with this opinion have we established methods for the admission of DNA evidence under § 36-18-30. The record is unclear as to whether this standard was met with respect to the DNA population frequency statistical evidence. And, the potential impact on **Turner's** case is dramatic. Therefore, we remand this cause for the Court of Criminal Appeals to remand it for the trial court to conduct an evidentiary hearing to determine the admissibility of the DNA population frequency statistical evidence. If the trial court determines that the evidence was not admissible, it should order a new trial. If the trial court determines that the evidence was admissible, it should enter an order to that effect. In either case, the trial court should place in the record specific findings regarding the reliability and the relevance of the DNA population frequency statistical evidence.

REVERSED AND REMANDED.

HOOPER, C.J., and MADDOX, HOUSTON, KENNEDY, and BUTTS, JJ., concur.

[1] In Perry, 586 So.2d at 247, we explained the interaction of matching and statistical frequency analysis:

"After the autorad [an X-ray of DNA fragments] has been produced the results must be interpreted. The bands [DNA fragments] on the autorad in different lanes must be examined to determine if they "match". The bands in various lanes on the autorad are visually inspected to see if they co-migrate. If a match is declared, the issue is reduced to determining the likelihood that the match is unique. A match is said to occur if the sizes and number of the detected RFLPs [restriction fragment length polymorphisms (i.e., variations in the manner in which organic base pairs composing a DNA molecule expand when exposed to a restriction enzyme)] in various lanes are indistinguishable within a permissible degree of error. They are then measured either manually or by a digitizer attached to a computer. Whatever standard of measuring error is used to determine if the bands are indistinguishable must also be used when calculating the frequency of the band in the population.

"The "uniqueness" question is answered according to the principles of population genetics, using the same matching rule or standard deviation."

(Quoting People v. Castro, 144 Misc.2d 956, 967, 545 N.Y.S.2d 985, 992 (N.Y. Sup. 1989)).

[2] "Scientific methodology today is based on generating hypotheses and testing them to see if they can be falsified..." Daubert, 509 U.S. at 593, 113 S.Ct. at 2796 (quoting Michael D. Green, *Expert Witnesses and Sufficiency of Evidence in Toxic Substances Litigation*, 86 Nw. U.L.Rev. 643, 645 (1992)). The "scientific method" achieved prominence in Sir Isaac Newton's *Principia*. 5 *The Encyclopedia of Philosophy* 490 (Paul Edwards ed., 1967). See generally Jay Kesan, Note, *An Autopsy of Scientific Evidence in a Post-Daubert World*, 84 Geo. L.J. 1985, 2006-10 (1996) (discussing scientific methodology).

[3] "Scientific validity" entails the characteristics of internal consistency, logical form, comparability with other scientific theories, and susceptibility to empirical testing. See Kenneth R. Foster & Peter W. Huber, *Judging Science: Scientific Knowledge and the Federal Courts* 138-40 (1997) (discussing scientific validity).

[4] The Eighth Circuit stated:

"This court granted rehearing en banc and vacated the *Two Bulls* panel opinion, then, upon suggestion of death of the appellant, this court vacated the scheduled en banc hearing and ordered that the appeal be dismissed. United States v. Two Bulls, 925 F.2d 1127 (8th Cir. 1991). Insofar as this vacated opinion ha[d] any precedential value, it ended with Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 [113 S.Ct. 2786, 125 L.Ed.2d 469] ... (1993)."

Pioneer Hi-Bred, 35 F.3d at 1229 n. 12.

[5] Other federal courts of appeals have also held that the actual performance of a scientific test goes to the weight of the evidence, not its admissibility. See, e.g., McCulloch v. H.B. Fuller Co., 61 F.3d 1038 (2d Cir. 1995) (holding that error in the use of "differential etiology" methodology goes to weight, not admissibility); United States v. Chischilly, 30 F.3d 1144, 1154 (9th Cir. 1994) (holding that dispute over the conduct of laboratory procedures goes to weight, not admissibility), cert. denied, 513 U.S. 1132, 115 S.Ct. 946, 130 L.Ed.2d 890 (1995). These holdings have been echoed by commentators. See, e.g., Kesan, supra, note 2, at 2020-21 ("If the two-prong test of *Daubert* is satisfied, presumably any errors or shortcomings in the execution of the methodology should be a question of weight that lies within the province of the jury.").

[6] We note that "[m]any courts have stated that the general scientific theory underlying DNA print analysis is almost universally accepted in the scientific community." Perry, 586 So.2d at 245. Further, § 36-18-20(d) sets forth the Legislature's finding "[t]hat genetic identification technology through DNA testing is generally accepted by the relevant scientific community."

[7] With respect to expert scientific testimony on subjects other than DNA techniques governed by § 36-18-30, *Frye* remains the standard of admissibility in Alabama. See Hoosier v. State, 612 So.2d 1352 (Ala. Crim. App. 1992); Rivers v. Black, 259 Ala. 528, 68 So.2d 2 (1953).

[8] Moreover, although we conclude that the *Perry* standard of admissibility has been replaced with respect to DNA evidence, the following discovery and burden-of-proof guidelines established in Perry, 586 So.2d at 255, and as modified for the *Daubert* test, remain viable:

"1. The proponent of the [challenged] DNA evidence ... should give discovery to the adversary, which should include, upon request: (1) Copies of autorads, with the opportunity to examine the originals. (2) Copies of laboratory books. (3) Copies of quality control tests run on material utilized. (4) Copies of reports by the testing laboratory issued to the proponent. (5) A written report by the testing laboratory setting forth the method used to declare a match or non-match, with actual size measurements, and mean or average size measurement,

if applicable, together with standard deviation used. (6) A statement setting forth observed contaminants, the reasons therefor, and tests performed to determine the origin and the effects thereof. (7) If the sample is degraded, a statement setting forth the tests performed and the results thereof. (8) A statement setting forth any other observed effects or laboratory errors, the reasons therefor and the effects thereof. (9) Chain of custody documents. (10) A statement by the testing lab, setting forth the method used to calculate the allele [(i.e., particular form of gene)] frequency in the relevant population. (11) A copy of the data pool for each [locus] examined. (12) A certification by the testing lab that the same rule used to declare a match was used to determine the allele frequency in the population. (Note that the discovery provisions in (10), (11), and (12) specifically address evidence of DNA population frequency statistics.)

"2. The proponent shall have the burden of going forward to establish that the tests and calculations were [both reliable and relevant]. Once this burden is met, the burden of proof shifts to the adversary to prove, by a preponderance of the evidence, that the tests and calculations should be suppressed or modified."

(Quoting Castro, 144 Misc.2d at 978-79, 545 N.Y.S.2d at 999).

[9] We note that general acceptance is the most stringent factor of the *Daubert* reliability test. Daubert, 509 U.S. at 594, 597, 113 S.Ct. at 2797, 2798 Several federal courts have held that if evidence is based on a generally accepted theory and technique, then it is admissible under *Daubert*. See, e.g., *Smith v. Borg*, 1 F.3d 1247 (9th Cir.1993); *Pioneer Hi-Bred Int'l v. Holden Foundation Seeds, Inc.*, 35 F.3d 1226, 1230 (8th Cir.1994).

[10] As we held in *Perry, 586 So.2d at 254*, before admitting only one type of evidence (i.e., matching evidence or population frequency statistical evidence), the trial court must determine whether the probative value of admitting one type without the other type will outweigh the prejudicial impact the evidence may have on the jury.

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