COURT OF CRIMINAL APPEALS OF TEXAS

Kelly v. State

Kelly v. State, 824 S.W.2d 568 (Tex. Crim. App. 1992) · No. No. 969-90 · Decided February 5, 1992

OPINION

PER CURIAM.

824 S.W.2d 568 (1992) Barry Dean KELLY, Appellant, v. The STATE of Texas, Appellee. No. 969-90. Court of Criminal Appeals of Texas, En Banc. February 5, 1992. *569 Richard Alley, Fort Worth, for appellant. Tim Curry, Dist. Atty. and C. Chris Marshall, Betty Marshall, Alan Levy and Robert K. Gill, Asst. Dist. Attys., Fort Worth, Robert Huttash, State's Atty., Austin, for State.

Before the court en banc. OPINION ON APPELLANT'S PETITION FOR DISCRETIONARY REVIEW CAMPBELL, Judge. A jury found appellant, Barry Dean Kelly, guilty of murder and assessed his punishment at imprisonment for life. Tex. Penal Code § 19.02(a)(1).

The Second Court of Appeals affirmed appellant's conviction. Kelly v. State, 792 S.W.2d 579 (Tex.App. Fort Worth 1990). We granted appellant's petition for discretionary review, pursuant to Texas Rule of Appellate Procedure 200(c)(2), to determine whether the court of appeals erred in holding that the trial court did not abuse its discretion in admitting DNA "fingerprint" evidence[1] at appellant's trial over his objection.[2] We will affirm the judgment of the court of appeals.

Before trial, appellant filed a motion to suppress any expert testimony regarding DNA identification test results on the ground that such tests had "not gained general acceptance [as reliable] in the scientific community in which such testing belongs." At trial, after the State indicated its intention to offer expert testimony regarding a DNA identification test, the trial court conducted a hearing to determine the admissibility of such testimony.

The hearing was conducted outside the presence of the jury, pursuant to Texas Rule of Criminal Evidence 104(a) and (c).[3] I. THE EXPERT TESTIMONY Six witnesses testified at the suppression hearingfive for the State and one for the defense. According to the testimony presented, the State's witnesses and their backgrounds were as follows: (1) Alan Matthews Giusti, holder of a B.S. degree in molecular biology from Yale University, former laboratory technician at Lifecodes Corporation;[4] (2) Kevin McElfresh, holder of a Ph.D. degree in molecular and population genetics from the University of Georgia, laboratory supervisor at Lifecodes Corporation; (3) Philip Stewart Hartman, genetics professor at Texas Christian University in Fort Worth, never affiliated with Lifecodes; (4) Joseph Frank Sambrook, holder of a Ph.D. degree in microbiology, chairman of the biochemistry department at Southwestern Medical School in Dallas, never affiliated with Lifecodes; and (5) Robert C. Benjamin, holder of a Ph.D. degree in

biology from Harvard University, professor of biology at the University of North Texas in Denton, never affiliated with Lifecodes.

In brief, the testimony of the State's expert witnesses at the suppression hearing established the following: (1) it is generally accepted by molecular biologists that each person's DNA is unique and does not *570 change during that person's lifetime (Hartman); (2) the "restriction fragment length polymorphism" (RFLP) technique,[5] generally accepted by molecular biologists as reliable, can be used to compare a known sample of DNA with an unknown sample of DNA to determine whether the two samples share certain molecular characteristics (McElfresh, Hartman, Sambrook, Benjamin); [6] (3) studies of sample populations can be used to determine reliably the frequencies, within the general population, of the molecular characteristics in question (McElfresh, Hartman, Sambrook); (4) sufficient studies of sample populations have already been performed to allow reliable calculations concerning the frequencies, within the general population, of the molecular characteristics in question (McElfresh, Hartman, Sambrook); (5) a false "match" of a known DNA sample with an unknown DNA sample is impossible with the RFLP technique (McElfresh, Hartman, Sambrook, Benjamin); (6) reliable and generally accepted techniques are available to extract DNA from blood and semen stains (Hartman); (7) Lifecodes Corporation utilized both a generally accepted DNA extraction technique and the RFLP technique to compare DNA from appellant's blood with DNA from a semen stain found at the home of Appellant's victim (McElfresh, Giusti, Benjamin); (8) Lifecodes' test showed that appellant's DNA shared certain molecular characteristics with the semen stain DNA (Giusti); (9) the RFLP analysis in this case was performed by Lifecodes in a scientifically acceptable manner (Giusti).

John Thomas Castle, appellant's witness at the suppression hearing, testified that he had a B.S. degree in chemistry from Angelo State University in San Angelo, and that he was the owner-operator of Castle Forensic Laboratories in Dallas. He testified further that, in his opinion, the RFLP technique, at least as applied to forensic samples, was not generally accepted in the scientific community.

He also questioned the reliability of Lifecodes' test results because, he claimed, Lifecodes had a policy of re-using certain laboratory materials. At the conclusion of the testimony at the suppression hearing, appellant argued that DNA identification evidence was inadmissible under Frye v. United States, 293 F. 1013 (D.C.Cir.1923), because such evidence was, according to appellant, "not accepted [as reliable] in the scientific community and [by] the folks who deal with DNA."

Appellant also argued that insufficient population studies had been conducted to make a DNA "match" meaningful. The State responded that the holding in Frye was not binding on Texas courts and that the evidence in question had been shown to be reliable and thus admissible under Texas Rule of Criminal Evidence 702.

After the litigants concluded their arguments, the trial court stated: I'm going to find that the DNA testing, genetic testing evidence is probative of material issues involved in the case. The material evidence is relevant.

The evidence is relevant to the matters before the Court. Its relevancy does notits relevancy outweighs the prejudicial effect of it, and the Court will find that the testimony of the expert witnesses presented by the State established that the DNA testing procedure employed in this case is reliable and that it is generally accepted in the relevant scientific community.

For that reason, I will deny your motion to exclude the evidence of the DNA genetic tests and will permit the State to present such evidence before the jury. (Emphasis added.) Hartman, Giusti, Sambrook, and McElfresh testified again before the jury, essentially repeating the testimony they gave at the suppression hearing.

In addition, however, Sambrook and McElfresh testified that, according to their calculations, only *571 one person in approximately 13 million possesses DNA with the same molecular characteristics that Lifecodes' test showed were shared by appellant's DNA and the DNA extracted from the semen stain found at the home of appellant's victim.

In other words, Lifecodes' test did not positively identify appellant as the source of the semen, but the test did place appellant within the almost infinitesimal class of males who could have been the source. II. THE ARGUMENTS Appellant argues now, as he did below, that the Frye "general acceptance" test governs the admissibility of scientific evidence in Texas courts and that the trial court abused its discretion in admitting the DNA evidence because, according to appellant, DNA identification testsand Lifecodes' procedures in particularare not generally accepted as reliable by any scientific community.

In support of his argument, Appellant cites various authorities that have questioned the reliability of DNA identification testing. See, e.g., J. Neufield & N. Colman, When Science Takes the Witness Stand, Scientific American 46 (May 1990); Note, The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant, 42 Stanford L.Rev. 465 (1990).

The State counterargues that the "helpfulness" test of Rule 702 governs the admissibility of all expert testimony, scientific or otherwise, and that the DNA evidence at Appellant's trial was proven to be reliable and helpful and thus admissible under Rule 702.[7] III. THE HOLDING OF THE COURT OF APPEALS The Second Court of Appeals agreed with the State and held that the trial court Ford, 301 S.C.

485, 392 S.E.2d 781 (1990); State did not abuse its discretion in admitting the expert testimony. More specifically, the court of appeals "found" that the DNA evidence was reliable, and thus admissible, "since expert testimony established the underlying scientific principle was valid, the

technique applying the principle was valid, and the technique was properly applied for tests in this case."

Kelly v. State, 792 S.W.2d at 585. IV. THE PRESENT VIABILITY OF THE FRYE TEST To determine whether the court of appeals erred in holding that the trial court did not abuse its discretion, we must first determine what test governs the admissibility of novel scientific evidence in Texas criminal trials.

We must then determine whether the trial court's decision admitting the DNA evidence was reasonable given the testimony at the suppression hearing and given the governing test of admissibility. The test which some jurisdictions[8] use with respect to the admission of novel scientific evidence is the test that was enunciated in Frye: 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 wellrecognized 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. *572 293 F. at 1014.

The Frye court thus imposed a "general acceptance" test on the admissibility of scientific evidence. See generally Jones v. State, 716 S.W.2d 142, 145-153 (Tex.App.Austin 1986, pet. refd) (discussing pros and cons of Frye test).

Although this Court has never explicitly adopted the Frye test, on several occasions we have used a general acceptance test when reviewing lower court decisions regarding the admission of scientific evidence. See Zani v. State, 758 S.W.2d 233 (Tex.Cr.App. 1988); Reed v. State, 644 S.W.2d 479 (Tex.Cr.App.1983); Cain v. State, 549 S.W.2d 707 (Tex.Cr.App.1977); Romero v. State, 493 S.W.2d 206 (Tex.Cr.

App.1973). In all those cases, however, the trials were held before the promulgation of the Texas Rules of Criminal Evidence. Since the promulgation of the Rules in 1986, Rule 702 has governed the admission of all expert testimony.[9] That rule provides: 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.

We have recognized before that the "threshold determination" for a trial court[10] to make regarding the admission of expert testimony is whether that testimony will help the trier of fact understand the evidence or determine a fact in issue. Duckett v. State, 797 S.W.2d 906, 910 (Tex. Cr.App. 1990); see S. Goode, et al., Guide to the Texas Rules of Evidence § 702.2 (1988).

Thus, in a case such as thiswhere the trial court was faced with an offer of expert testimony on a scientific topic unfamiliar to lay jurorsthe trial court's first task is to determine whether the testimony is sufficiently reliable and relevant to help the jury in reaching accurate results. "Unreliable... scientific evidence simply will not assist the [jury] to understand the evidence or accurately determine a fact in issue; such evidence obfuscates rather than leads to an intelligent evaluation of the facts."

K. Kreiling, Scientific Evidence: Toward Providing the Lay Trier With the Comprehensible and Reliable Evidence Necessary to Meet the Goals of the Rules of Evidence, 32 Ariz.L.Rev. 915, 941-942 (1990). If the trial judge determines that the proffered expert testimony is reliable (and thus probative and relevant), then she must next determine whether, on balance, that testimony might nevertheless be unhelpful to the trier of fact for other reasons.[11] For example, even reliable and relevant expert testimony may be unhelpful if it is merely cumulative, or would confuse or mislead the jury, or would consume an inordinate amount of trial time.

In short, if the trial judge determines that the proffered expert testimony is reliable and relevant, she must still decide whether the probative value of the testimony is outweighed by one or more of the factors identified in Rule 403. See 3 J. Weinstein & M. Berger, Weinstein's Evidence para. 702[03] (1991). Is the Frye general acceptance test still a part of Texas law?

We conclude that it is not. First, there is no textual basis in Rule 702 for a special admissibility standard for novel scientific evidence. Second, as should be fairly obvious, scientific evidence may be shown reliable even though not yet generally accepted in the relevant scientific community.[12] *573 V. PROOF OF RELIABILITY How does the proponent of novel scientific evidence prove it to be reliable?

As a matter of common sense, evidence derived from a scientific theory, to be considered reliable, must satisfy three criteria in any particular case: (a) the underlying scientific theory must be valid; (b) the technique applying the theory must be valid; and (c) the technique must have been properly applied on the occasion in question. See generally Tex.R.Crim.Evid.

705; P. Giannelli & E. Imwinkelried, Scientific Evidence § 1-1 (1986). Under Rule 104(a) and (c) and Rule 702, all three criteria must be proven to the trial court, outside the presence of the jury, before the evidence may be admitted. Factors that could affect a trial court's determination of reliability include, but are not limited to, the following: (1) the extent to which the underlying scientific theory and technique are accepted as valid by the relevant scientific community, if such a community can be ascertained; (2) the qualifications of the experts) testifying; (3) the existence of literature supporting or rejecting the underlying scientific theory and technique; (4) the potential rate of error of the technique; (5) the availability of other experts to test and evaluate the technique; (6) the clarity with which the underlying scientific theory and technique can be

explained to the court; and (7) the experience and skill of the person(s) who applied the technique on the occasion in question.

See 3 J. Weinstein & M. Berger, Weinstein's Evidence para. 702[03] (1991). VI. THE PROPONENT'S BURDEN OF PERSUASION What burden of persuasion does the proponent of novel scientific evidence carry under Rule 702?[13] Unfortunately, our rules of evidence do not prescribe the burden of persuasion or imply what burden might be appropriate.

In Zani v. State, 758 S.W.2d at 243, however, in addressing the burden of persuasion required of the proponent of posthypnotic testimony, we held that because of the "uncertainties inherent" in the evidence, "it [was] appropriate to require the proponent of such [evidence] to demonstrate... by clear and convincing evidence, that such [evidence was] trustworthy."

Although Zani was a pre-Rules case, we believe that its reasoning on this issue remains persuasive. Because of the difficulty laypersons have in evaluating the reliability of novel scientific testimony, we conclude it is appropriate for the burden of persuasion to be enhanced, i.e., that the burden be that of clear and convincing evidence rather than simply the preponderance of the evidence.

In other words, before novel scientific evidence may be admitted under Rule 702, the proponent must persuade the trial court, by clear and convincing evidence, that the evidence is reliable and therefore relevant. See E. Geary, ed., McCormick on Evidence § 340 (1984). VII. SUMMARY To summarize, under Rule 702 the proponent of novel scientific evidence must prove to the trial court, by clear and convincing evidence and outside the presence of the jury, that the proffered evidence is relevant.

If the trial court is so persuaded, then the evidence should be admitted for the jury's consideration, unless the trial court determines that the probative value of the evidence is outweighed by some factor identified in Rule 403. *574 VIII. THE TRIAL COURT'S DECISION We come finally to the question of whether the trial court abused its discretion in admitting the DNA evidence in the instant case.

That is, we must determine whether the trial court's decision was "within the zone of reasonable disagreement" given the evidence presented at the suppression hearing and given the requirements of Rule 702. Montgomery v. State, 810 S.W.2d 372, 391 (Tex.Cr.App. 1990);[14] see also Duckett v. State, 797 S.W.2d at 913.

The trial court was, of course, the sole judge of the weight and credibility of the evidence presented at the suppression hearing. Viewing that evidence in the light most favorable to the trial court's decision, we conclude that it was demonstrated by clear and convincing evidence that the scientific principle underlying the RFLP technique was valid, that the RFLP technique itself was

valid, that the technique was properly applied in this case, and that the related population frequency studies were also valid and reliable.

Moreover, there is nothing in the record to suggest that the probative value of the DNA evidence was outweighed by one of the Rule 403 factors. We conclude, therefore, that the trial court's decision to admit the DNA evidence was reasonable given the evidence presented at the suppression hearing and given the requirements of Rule 702.

The court of appeals did not err in its holding that the trial court did not abuse its discretion in admitting the DNA evidence. The judgment of the court of appeals is AFFIRMED. CLINTON, Judge, concurring. This cause is important, not just because it declares that DNA evidence may be found admissible in Texas, but more so because it announces a new standard for determining admissibility of evidence premised upon novel scientific theories or techniques.

In announcing the new standard the majority squarely rejects the test in Frye v. United States, 293 F. 1013 (C.A.D.C.1923), which this Court has seen fit to invoke, albeit sporadically, over the years. Zani v. State, 758 S.W.2d 233, at 241 (Tex.Cr.App. 1988). Certainly the Frye rule is not without problems. See, e.g., Giannelli, P., The Admissibility of Novel Scientific Evidence: Frye v. United States, A Half-Century Later, 80 Colum.L.Rev.

1197, 1204-1231 (1980). Nevertheless, I hesitate so readily to relinquish the advantages of "general acceptance in the relevant scientific community" as a substantive standard by which a court can determine reliability, and hence, relevance of a novel scientific theory or technique.

The beginning, middle and end of the majority's analysis is Tex.R.Cr.Evid., Rule 702. This rule reads: 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.

I believe the majority opinion errs to premise its argument exclusively on Rule 702. Admissibility of novel scientific evidence, as with admissibility of any evidence, is first and foremost a question of relevancy. And relevance of novel scientific evidence is a function of its reliability.[1] But Rule 702 is not meant to insure the relevance of "scientific, technical, or other specialized knowledge."

Nor, inasmuch as relevance of scientific, etc., knowledge is a function of reliability of the theory or technique espoused, does Rule 702 require that "scientific, *575 technical or other specialized knowledge" be reliable. Tex.R.Cr.Evid., Rules 401 and 402 are the provisions that require reliability, and hence relevancy, of "specialized knowledge." If such knowledge is not reliable/relevant, it will be inadmissible under Rule 402.

That such knowledge must "assist the trier of fact to understand the evidence or to determine a fact in issue," it seems to me, means something else entirely. Under Rule 702, even if reliable/relevant, specialized knowledge must either supply or refute, or at least illuminate, an elemental fact (or some evidentiary fact leading to an elemental fact) in a way not readily apparent to a jury of laymen without that knowledge.

Whenever it may contribute to a fuller comprehension by the jury of the evidence or the issues involved, "specialized knowledge" is admissible. By implication, specialized knowledge which does not contribute in any degree to a fuller comprehension is inadmissible, even if reliable/relevant.[2] My point is this: novel scientific evidence must be "reliable," if at all, not because otherwise it will not "assist the trier of fact" as required by Rule 702 (although that will probably be true, incidentally, since irrelevant evidence by definition fails to assist the trier of fact); rather, it must be reliable in order to be deemed relevant, under Rules 401 and 402.

See note 1, ante. In any event, I concur with the majority inasmuch as it concludes that admissibility of evidence of or based upon a novel scientific theory or technique is a function of reliability. It must be shown by the proponent of such evidence that the new theory or technique provides a valid test for the probability of the existence, vel non, of a fact of consequence to the determination of the action.

Rule 401, supra. What is not "fairly obvious" to me, however, is that "scientific evidence may be shown to be reliable even though not yet generally accepted in the relevant scientific community." Majority at 573. The majority does not elaborate.

The majority does ask, "How does the proponent of novel scientific evidence prove it to be reliable?" In answering its own question the majority supplies much that is helpful in the way of procedure. I agree that the proponent should be required to show that the theory behind a new scientific procedure is valid; that the technique is a valid application of the theory; and that the proper protocols have been followed in applying the technique in the individual case.

I can accept that "all three criteria must be proven to the trial court" as a matter of admissibility of the evidence.[3] Although I do not think it is compelled, I agree it is a sound idea to require that the trial court find these criteria have been established by clear and convincing evidence. When it comes to announce a substantive test by which trial courts can exercise, and appellate courts can review the discretion to admit or exclude novel scientific evidence, the majority opinion is less than satisfactory.

It is true the majority expressly makes the extent of acceptance of a new scientific theory or technique a consideration for the trial judge in determining validity. Unlike the Frye rule, however, the majority's test leaves the ultimate decision of validity to the trial court.

The majority rejects the Frye rule because under it some evidence based upon presumably *576 "valid" theory and technique will be inadmissible simply because the "relevant scientific community" has not caught up. This seems to me to beg the question of who most properly decides questions of validity of novel scientific theories.

The greatest advantage of the Frye test is that it essentially leaves the question of validity of novel theories and techniques to those whose vocation it is to view the world from the perspective of the scientific method, viz: the scientists. Trial judges are ill equipped to make the determination whether a given theory or technique has been sufficiently "tested in the crucible of controlled experimentation and study" that it can accurately be said to gauge the probability of the existence, vel non, of a fact in issue.[4] The Frye rule does not require him to make this determination.

Instead it requires him to decide whether scientists themselves believe the theory or technique has been sufficiently tested. The majority worries that evidence that may ultimately be accepted as reliable by the general run of scientists will be lost in the meantime under the Frye rule.

The contested evidence may make the difference between conviction and acquittal. It seems to me that a conservative approach is justified, however. Convictions now on the basis of evidence that later proves universally rejected by the scientific community will not only result in injustice, but also make the courts look gullible, even foolish. Presumably the majority would respond that the trial court can measure the sufficiency of a novel theory or technique to produce relevant evidence by the testimony, in the form of opinion or otherwise, of an expert, admissible under Rule 702, as to its reliability.

This testimony itself, however, may be subject to objection under Tex.R.Cr.Evid., Rule 705(c), "unless the party offering the testimony first establishes sufficient underlying facts or data." But what, in this context, constitutes sufficient underlying facts or data? Is it sufficient that the expert himself believes the new theory has been sufficiently tested by whatever means that scientific method would prescribe in the circumstances?

And what is the basis of his opinion of what scientific method would prescribe as an appropriate regimen of testing? Are the underlying facts and data supporting that opinion sufficient under Rule 705(c)? These questions are esoteric to begin with, involving as they do a discipline beyond the training and common experience of the average judge. They are doubly esoteric because they involve new areas of science beyond the common exposure of scientists themselves.

Yet the majority is content to let the trial judge measure reliability, and hence relevance of a novel scientific theory by the untested, and potentially untestable opinion of as few as one "expert." The majority believes that validity of a novel theory or technique can best be aired in context of the adversarial process.

The proponent of evidence presents his expert to champion the cause of admissibility, and then the opponent counters with his own expert to tell the trial court, from the perspective of the scientific method, all the deficiencies in the testing to date that would render the theory or technique questionable.

The trial court then makes a reasoned and informed decision. Entertaining the assumption that the trial judge can adequately take the place of the relevant scientific community as the arbiter of acceptability of new theories or techniques, this would seem an appropriate procedure. It certainly has the advantage of not being anti-systemic; that is, ideally, how the adversarial process works.

But will the system as it presently exists actually accommodate the level of adversarial testing we almost have to assume is necessary if we are to allow trial court judgments to replace scientific consensus? In our rules of criminal procedure we have no notice or pre-trial discovery requirements tailored to the use of evidence based upon novel scientific theories or techniques.

The first time a defense attorney may see the evidence coming is during voir *577 dire of a State's expert witness pursuant to Rule 705(b). By then it is clearly too late to marshall experts to formulate an opposing opinion (if any) as to the validity of either principle or technique underlying the proffered evidence.

Moreover, counsel must obtain "prior court approval" of fees for expert testimony on behalf of an indigent defendant under Article 26.05, V.A.C.C.P. What is a "reasonable expense" for expert testimony is pre-determined on a county by county basis,[5] and may prove woefully inadequate for the kind of time and effort involved in ascertaining reliability of a novel scientific theory or technique.

At any rate, without notice of what is coming, counsel for the indigent defendant can hardly obtain "prior court approval" for funds to pay an expert of his own. "Provisions for notice, full discovery, the opportunity to re-examine evidence, and the appointment of defense experts are critical components" of the type of procedure the majority advocates. Giannelli, supra, at 1245.

I doubt we are procedurally equipped to accommodate these needs. In short, the kind of adversarial testing that would be adequate to replace a Frye standard is simply not likely to occur. Trial judges will instead hear testimony from only one side of the issue, frequently from the representative of a commercial lab somewhere that has a vested interest in having its novel theory or technique held admissible in a court of law.[6] These circumstances hardly foster impartial decision making.

Preferable, in my view, would be to impose a substantive requirement on the part of the proponent of scientific evidence that as part of his burden of showing "validity" of both the principle and technique he demonstrate by clear and convincing evidence that both have gained general acceptance in the relevant scientific community.

As a practical matter, since the State is more often the proponent of such evidence, such a requirement will place the onus on the party with the greater resources. Because the question of general acceptance embraces the debate, if any, among scientists themselves as to validity of a novel theory or technique, the trial court is assured of hearing both sides of the argument, as well as the scientific consensus, if any, before ruling.

Not just as a practical matter, but as a legal matter as well, it seems to me the proponent of such evidence should have a burden to show general acceptance in the scientific community. The proponent should have to show such general acceptance in order to establish threshold relevance, and hence admissibility under Rule 402. It is true that ordinarily "the law furnishes no test of relevancy."

See Montgomery v. State, 810 S.W.2d 372, at 391 (Tex.Cr.App.1991) (Opinion on rehearing on Court's own motion). However, that is because ordinarily a trial court determines relevancy by "common observation and experience, and reason[s] from there in deciding whether the proffered evidence has `any tendency to make the existence of any fact of consequence to the determination of the action more or less probable than it would be without the evidence.'" Id. As I hope I have made clear already, however, whether a new scientific theory or technique has any such tendency is not within the compass of common observation and experience.

Only science in general can have the necessary perspective. And the best evidence of that is, of course, evidence of general acceptance, vel non, in the relevant scientific community. If the Court is reluctant to impose a Frye-type test within the relevancy provisions of Rules 401 and 402, another possibility would be to incorporate it within Rule 705(c).[7] We could rule that as a matter of *578 law the proponent of novel scientific evidence "does not have a sufficient basis for his opinion" if the theory or technique he relies on is not generally accepted in the relevant scientific communitythat absent such general acceptance, he has not established "sufficient underlying facts or data."

We would not thereby deviate from interpretation of the Federal Rules, since they contain no analogue to our Rule 705(c). By focusing exclusively on Rule 702, and by refusing to acknowledge the utility of general acceptance in the relevant scientific community, or some improvement thereon, as a substantive standard for trial courts to use in determining reliability, it seems to me, the majority errs.

The trial court did rule in this cause that "the DNA testing procedure employed in this case... is generally accepted in the relevant scientific community." Because the record supports that conclusion, I concur in the result the majority reaches, but do not join its opinion. BAIRD and OVERSTREET, JJ., join in this opinion. NOTES [1] DNA (deoxyribonucleic acid) is an "organic chemical of complex molecular structure that is found in all living cells and that codes genetic information for the transmission of inherited traits."

4 Encyclopedia Britannica 140 (1990). [2] In three grounds for review, appellant argues specifically that the "general acceptance" standard enunciated in Frye v. United States, 293 F. 1013 (D.C.Cir.1923), governs the admissibility of scientific evidence in Texas criminal trials and that the trial court erred in admitting DNA identification evidence at his trial because DNA evidence, according to appellant, is not generally accepted by the relevant scientific community.

[3] Rule 104 provides in relevant part: (a) Preliminary questions concerning the... admissibility of evidence shall be determined by the court.... (c) Hearings on the admissibility of confessions shall in all cases be conducted out of the hearing of the jury. Hearings on other preliminary matters shall be so conducted when the interests of justice require [4] Lifecodes Corporation, of Valhalla, New York, was the commercial biotechnology laboratory that conducted the DNA identification test in this case.

[5] Technical details regarding the RFLP technique can be found in L. Kirby, DNA Fingerprinting (1990) and in U.S. Congress, Office of Technology Assessment, Genetic Witness: Forensic Uses of DNA Tests (July 1990). [6] In other words, the RFLP technique cannot determine whether two samples of DNA are actually identical. Rather, the technique reveals only whether the DNA molecules have certain common characteristics.

[7] The State also points out that DNA identification evidence has been held admissible by virtually every appellate court that has considered the question. See, e.g.. United States v. Jakobetz, 955 F.2d 786 (2d Cir.1992); Caldwell v. State, 393 S.E.2d 436 (Ga.1990); State v. Brown, 470 N.W.2d 30 (Iowa 1991); Smith v. Deppish, 248 Kan. 217, 807 P.2d 144 (1991); State v. Schwartz, 447 N.W.2d 422 (Minn.

1989); State v. v. Wimberly, 467 N.W.2d 499 (S.D.1991); Spencer v. Commonwealth, 238 Va. 275, 384 S.E.2d 775 (1989), cert, denied, 493 U.S. 1036, 110 S. Ct. 759, 107 L. Ed. 2d 775 (1990). [8] See, e.g., Novak v. United States, 865 F.2d 718 (6th Cir.1989); United States v. Smith, 869 F.2d 348 (7th Cir.1989); State v. Schwartz, 447 N.W.2d 422 (Minn. 1989); State v. Ford, 301 S.C.

485, 392 S.E.2d 781 (1990). [9] Because of its nature, scientific evidence will almost always be offered through the testimony of experts. [10] Rule 104(a) requires that the admissibility of expert testimony be determined by the trial court. See S. Goode, et al.. Guide to the Texas Rules of Evidence § 702.2 at 501 (1988).

[11] Thus, Rule 702 incorporates Rule 402 and 403 analyses. [12] "[Federal] Rule 702's failure to incorporate a general scientific acceptance standard, and the Advisory Committee Note's failure to even mention the Frye case must be considered significant.

The silence of the rule and its drafters may arguably be regarded as tantamount to an abandonment of the general acceptance standard." 3 J. Weinstein & M. Berger, Weinstein's Evidence para.

702[03] at 702-36 (1991). Cases utilizing a Rule 702-type relevancy test for the admissibility of scientific evidence in elude, for example, United States v. Jakobetz, 955 F.2d 786 (2d Cir.1992); United States v. Williams, 583 F.2d 1194 (2d Cir.1978), cert, denied, 439 U.S. 1117, 99 S. Ct.

1025, 59 L. Ed. 2d 77 (1979); DeLuca v. Merrell Dow Pharmaceuticals, 911 F.2d 941 (3d Cir.1990); State v. Brown, 470 N.W.2d 30 (Iowa 1991). Some jurisdictions hold that the relevancy test incorporates the Frye test. See, e.g., United States v. Two Bulb, 918 F.2d 56 (8th Cir.1990).

[13] In Bourjaily v. United States, 483 U.S. 171, 107 S. Ct. 2775, 97 L. Ed. 2d 144 (1987), the United States Supreme Court concluded that all preliminary fact findings under Federal Rule of Evidence 104(a) are subject to the preponderance of the evidence (i.e., "more probable than not") burden of persuasion. See also Huddleston v. United States, 485 U.S. 681, 108 S. Ct.

1496, 99 L. Ed. 2d 771 (1988). We need not decide today what burden of persuasion is applicable under Texas Rule of Criminal Evidence 702 when the scientific evidence proffered is not truly "novel." [14] In Montgomery v. State, we explained in some detail the appellate court function under an abuse of discretion standard.

[1] If the proponent of evidence of a novel scientific theory or technique cannot show it establishes or refutes, tends to establish or refute, or at least makes "more or less probable" "the existence of any fact that is of consequence to the determination of the action," then it is not relevant under Rule 401, and is therefore inadmissible under Rule 402. If a novel scientific theory or technique does not prove to be a valid test for the probability of the existence, vel non, of a fact in issueif, in this sense, it is not "reliable"then it will not generate "relevant" evidence.

[2] Whether proffered evidence of specialized knowledge will in fact add to the jury's comprehension is, of course, a matter of the discretion of the trial court, which discretion is abused only where he finds evidence is admissible even though it contributes to the jury's comprehension not at all. Cf. Montgomery v. State, 810 S.W.2d 372, at 387 (Tex.Cr.App.1991) (Opinion on rehearing on Court's own motion) (trial court has discretion in deciding whether evidence has relevance beyond "character conformity," but no discretion to admit evidence which has no relevance beyond "character conformity").

[3] I accept this as a matter of policy-generated interpolation. I do not believe that Tex.R.Cr. Evid., Rule 104(a) substantively dictates what is a "preliminary question concerning the... admissibility of evidence," but only requires that whatever is determined to be a preliminary question of admissibility be decided in camera.

We could just as easily hold that the question whether proper protocol was followed in the particular case is a question of weight rather than admissibility. [4] Giannelli, supra, at 1249, quoting People v. Collins, 94 Misc. 2d 704, 709-710, 405 N.Y.S.2d 365, 369 (Sup.Ct.1978).

[5] Prior to amendment by Acts 1987, 70th Leg., ch. 979, p. 3323, § 3, eff. Sept. 1, 1987, Article 26.05, Sec. 1(d) set a limit of $500.00 on fees for appointed experts. [6] Indeed, a perfect example of this latter proposition is to be found in the context of DNA identification evidence. See generally Neufeld & Colman, When Science Takes the Witness Stand, Scientific American, Vol.

262, No. 5, p. 46 (May 1990). [7] Rule 705(c), reads: "If the court determines that the expert does not have a sufficient basis for his opinion, the opinion is inadmissible unless the party offering the testimony first establishes sufficient underlying facts or data."

CAMPBELL, J.

OPINION ON APPELLANT'S PETITION FOR DISCRETIONARY REVIEW CAMPBELL, Judge. A jury found appellant, Barry Dean Kelly, guilty of murder and assessed his punishment at imprisonment for life. Tex.Penal Code § 19.02(a)(1).

The Second Court of Appeals affirmed appellant's conviction. Kelly v. State, 792 S.W.2d 579 (Tex.App.—Fort Worth 1990). We granted appellant's petition for discretionary review, pursuant to Texas Rule of Appellate Procedure 200(c)(2), to determine whether the court of appeals erred in holding that the trial court did not abuse its discretion in admitting DNA "fingerprint" evidence1 at appellant's trial over his objection.2 We will affirm the judgment of the court of appeals.

Before trial, appellant filed a motion to suppress any expert testimony regarding DNA identification test results on the ground that such tests had "not gained general acceptance [as reliable] in the scientific community in which such testing belongs." At trial, after the State indicated its intention to offer expert testimony regarding a DNA identification test, the trial court conducted a hearing to determine the admissibility of such testimony.

The hearing was conducted outside the presence of the jury, pursuant to Texas Rule of Criminal Evidence 104(a) and (e).3 I. THE EXPERT TESTIMONY Six witnesses testified at the suppression hearing — five for the State and one for the defense. According to the testimony presented, the State's witnesses and their backgrounds were as follows: (1) Alan Matthews Giusti, holder of a B.S. degree in molecular biology from Yale University, former laboratory technician at Lifecodes Corporation;4 (2) Kevin McElfresh, holder of a Ph.D. degree in molecular and population genetics from the University of Georgia, laboratory supervisor at Lifecodes Corporation; (3) Philip Stewart Hartman, genetics professor at Texas Christian University in Fort Worth, never affiliated with Lifecodes; (4) Joseph Frank Sambrook, holder of a Ph.D. degree in microbiology, chairman of the biochemistry department at Southwestern Medical School in Dallas, never affiliated with Lifecodes; and (5) Robert C. Benjamin, holder of a Ph.D. degree in biology from Harvard University, professor of biology at the University of North Texas in Denton, never affiliated with Lifecodes.

In brief, the testimony of the State's expert witnesses at the suppression hearing established the following: (1) it is generally accepted by molecular biologists that each person's DNA is unique and does not *570change during that person's lifetime (Hartman); (2) the "restriction fragment length polymorphism" (RFLP) technique,5 generally accepted by molecular biologists as reliable, can be used to compare a known sample of DNA with an unknown sample of DNA to determine whether the two samples share certain molecular characteristics (McElfresh, Hartman, Sambrook, Benjamin); 6 (3) studies of sample populations can be used to determine reliably the frequencies, within the general population, of the molecular characteristics in question (McElfresh, Hartman, Sambrook); (4) sufficient studies of sample populations have already been performed to allow reliable calculations concerning the frequencies, within the general population, of the molecular characteristics in question (McElfresh, Hartman, Sambrook); (5) a false "match" of a known DNA sample with an unknown DNA sample is impossible with the RFLP technique (McElfresh, Hartman, Sambrook, Benjamin); (6) reliable and generally accepted techniques are available to extract DNA from blood and semen stains (Hartman); (7) Lifecodes Corporation utilized both a generally accepted DNA extraction technique and the RFLP technique to compare DNA from appellant's blood with DNA from a semen stain found at the home of Appellant's victim (McElfresh, Giusti, Benjamin); (8) Lifecodes' test showed that appellant's DNA shared certain molecular characteristics with the semen stain DNA (Giusti); (9) the RFLP analysis in this case was performed by Lifecodes in a scientifically acceptable manner (Giusti).

John Thomas Castle, appellant's witness at the suppression hearing, testified that he had a B.S. degree in chemistry from Angelo State University in San Angelo, and that he was the owner-operator of Castle Forensic Laboratories in Dallas. He testified further that, in his opinion, the RFLP technique, at least as applied to forensic samples, was not generally accepted in the scientific community.

He also questioned the reliability of Lifecodes' test results because, he claimed, Lifecodes had a policy of re-using certain laboratory materials. At the conclusion of the testimony at the suppression hearing, appellant argued that DNA identification evidence was inadmissible under Frye v. United States, 293 F. 1013 (D.C.Cir.1923), because such evidence was, according to appellant, "not accepted [as reliable] in the scientific community and [by] the folks who deal with DNA." Appellant also argued that insufficient population studies had been conducted to make a DNA "match" meaningful.

The State responded that the holding in Frye was not binding on Texas courts and that the evidence in question had been shown to be reliable and thus admissible under Texas Rule of Criminal Evidence 702. After the litigants concluded their arguments, the trial court stated: I'm going to find that the DNA testing, genetic testing evidence is probative of material issues involved in the case.

The material evidence is relevant. The evidence is relevant to the matters before the Court. Its relevancy does not — its relevancy outweighs the prejudicial effect of it, and the Court will find that the testimony of the expert witnesses presented by the State established that the DNA testing procedure employed in this case is reliable and that it is generally accepted in the relevant scientific community.

For that reason, I will deny your motion to exclude the evidence of the DNA genetic tests and will permit the State to present such evidence before the jury. (Emphasis added.) Hartman, Giusti, Sambrook, and McEl-fresh testified again before the jury, essentially repeating the testimony they gave at the suppression hearing.

In addition, however, Sambrook and McElfresh testified that, according to their calculations, only *571one person in approximately 13 million possesses DNA with the same molecular characteristics that Lifecodes' test showed were shared by appellant's DNA and the DNA extracted from the semen stain found at the home of appellant's victim.

In other words, Lifecodes' test did not positively identify appellant as the source of the semen, but the test did place appellant within the almost infinitesimal class of males who could have been the source. II.THE ARGUMENTS Appellant argues now, as he did below, that the Frye "general acceptance" test governs the admissibility of scientific evidence in Texas courts and that the trial court abused its discretion in admitting the DNA evidence because, according to appellant, DNA identification tests — and Life-codes' procedures in particular — are not generally accepted as reliable by any scientific community.

In support of his argument, Appellant cites various authorities that have questioned the reliability of DNA identification testing. See, e.g., J. Neufield & N. Colman, When Science Takes the Witness Stand, Scientific American 46 (May 1990); Note, The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant, 42 Stanford L.Rev. 465 (1990).

The State counterargues that the "helpfulness" test of Rule 702 governs the admissibility of all expert testimony, scientific or otherwise, and that the DNA evidence at Appellant's trial was proven to be reliable and helpful and thus admissible under Rule 702.7 III.THE HOLDING OF THE COURT OF APPEALS The Second Court of Appeals agreed with the State and held that the trial court did not abuse its discretion in admitting the expert testimony.

More specifically, the court of appeals "found" that the DNA evidence was reliable, and thus admissible, "since expert testimony established the underlying scientific principle was valid, the technique applying the principle was valid, and the technique was properly applied for tests in this case." Kelly v. State, 792 S.W.2d at 585. IV.THE PRESENT VIABILITY OF THE FRYE TEST To determine whether the court of appeals erred in holding that the trial court did not abuse its

discretion, we must first determine what test governs the admissibility of novel scientific evidence in Texas criminal trials.

We must then determine whether the trial court's decision admitting the DNA evidence was reasonable given the testimony at the suppression hearing and given the governing test of admissibility. The test which some jurisdictions8 use with respect to the admission of novel scientific evidence is the test that was enunciated in Frye: 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. *572293 F. at 1014.

The Frye court thus imposed a "general acceptance" test on the admissibility of scientific evidence. See generally Jones v. State, 716 S.W.2d 142, 145-153 (Tex.App.—Austin 1986, pet. ref'd) (discussing pros and cons of Frye test).

Although this Court has never explicitly adopted the Frye test, on several occasions we have used a general acceptance test when reviewing lower court decisions regarding the admission of scientific evidence. See Zani v. State, 758 S.W.2d 233 (Tex.Cr.App.1988); Reed v. State, 644 S.W.2d 479 (Tex.Cr.App.1983); Cain v. State, 549 S.W.2d 707 (Tex.Cr.App.1977); Romero v. State, 493 S.W.2d 206 (Tex.Cr.App.1973).

In all those cases, however, the trials were held before the promulgation of the Texas Rules of Criminal Evidence. Since the promulgation of the Rules in 1986, Rule 702 has governed the admission of all expert testimony.9 That rule provides: 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.

We have recognized before that the "threshold determination" for a trial court10 to make regarding the admission of expert testimony is whether that testimony will help the trier of fact understand the evidence or determine a fact in issue. Duckett v. State, 797 S.W.2d 906, 910 (Tex.Cr.App.1990); see S. Goode, et al., Guide to the Texas Rules of Evidence § 702.2 (1988).

Thus, in a case such as this — where the trial court was faced with an offer of expert testimony on a scientific topic unfamiliar to lay jurors — the trial court's first task is to determine whether the testimony is sufficiently reliable and relevant to help the jury in reaching accurate results. "Unreliable... scientific evidence simply will not assist the [jury] to understand the evidence or accurately determine a fact in issue; such evidence obfuscates rather than leads to an intelligent

evaluation of the facts." K. Kreiling, Scientific Evidence: Toward Providing the Lay Trier With the Comprehensible and Reliable Evidence Necessary to Meet the Goals of the Rules of Evidence, 32 Ariz.L.Rev.

915, 941-942 (1990). If the trial judge determines that the proffered expert testimony is reliable (and thus probative and relevant), then she must next determine whether, on balance, that testimony might nevertheless be wnhelpful to the trier of fact for other reasons.11 For example, even reliable and relevant expert testimony may be unhelpful if it is merely cumulative, or would confuse or mislead the jury, or would consume an inordinate amount of trial time.

In short, if the trial judge determines that the proffered expert testimony is reliable and relevant, she must still decide whether the probative value of the testimony is outweighed by one or more of the factors identified in Rule 403. See 3 J. Weinstein & M. Berger, Wein-stein's Evidence para. 702[03] (1991). Is the Frye general acceptance test still a part of Texas law?

We conclude that it is not. First, there is no textual basis in Rule 702 for a special admissibility standard for novel scientific evidence. Second, as should be fairly obvious, scientific evidence may be shown reliable even though not yet generally accepted in the relevant scientific community.12 *573Y. PROOF OF RELIABILITY How does the proponent of novel scientific evidence prove it to be reliable?

As a matter of common sense, evidence derived from a scientific theory, to be considered reliable, must satisfy three criteria in any particular case: (a) the underlying scientific theory must be valid; (b) the technique applying the theory must be valid; and (c) the technique must have been properly applied on the occasion in question. See generally Tex.R.Crim.Evid.

705; P. Giannelli & E. Imwinkelried, Scientific Evidence § 1-1 (1986). Under Rule 104(a) and (c) and Rule 702, all three criteria must be proven to the trial court, outside the presence of the jury, before the evidence may be admitted. Factors that could affect a trial court's determination of reliability include, but are not limited to, the following: (1) the extent to which the underlying scientific theory and technique are accepted as valid by the relevant scientific community, if such a community can be ascertained; (2) the qualifications of the expert(s) testifying; (3) the existence of literature supporting or rejecting the underlying scientific theory and technique; (4) the potential rate of error of the technique; (5) the availability of other experts to test and evaluate the technique; (6) the clarity with which the underlying scientific theory and technique can be explained to the court; and (7) the experience and skill of the person(s) who applied the technique on the occasion in question.

See 3 J. Weinstein & M. Berger, Weinstein's Evidence para. 702[03] (1991). VI. THE PROPONENT'S BURDEN OF PERSUASION What burden of persuasion does the proponent of

novel scientific evidence carry under Rule 702?13 Unfortunately, our rules of evidence do not prescribe the burden of persuasion or imply what burden might be appropriate.

In Zani v. State, 758 S.W.2d at 243, however, in addressing the burden of persuasion required of the proponent of posthypnotic testimony, we held that because of the "uncertainties inherent" in the evidence, "it [was] appropriate to require the proponent of such [evidence] to demonstrate... by clear and convincing evidence, that such [evidence was] trustworthy." Although Zani was a pre-Rules case, we believe that its reasoning on this issue remains persuasive.

Because of the difficulty laypersons have in evaluating the reliability of novel scientific testimony, we conclude it is appropriate for the burden of persuasion to be enhanced, i.e., that the burden be that of clear and convincing evidence rather than simply the preponderance of the evidence.

In other words, before novel scientific evidence may be admitted under Rule 702, the proponent must persuade the trial court, by clear and convincing evidence, that the evidence is reliable and therefore relevant. See E. Cleary, ed., McCormick on Evidence § 340 (1984). VII. SUMMARY To summarize, under Rule 702 the proponent of novel scientific evidence must prove to the trial court, by clear and convincing evidence and outside the presence of the jury, that the proffered evidence is relevant.

If the trial court is so persuaded, then the evidence should be admitted for the jury's consideration, unless the trial court determines that the probative value of the evidence is outweighed by some factor identified in Rule 403. *574VIII. THE TRIAL COURT'S DECISION We come finally to the question of whether the trial court abused its discretion in admitting the DNA evidence in the instant case.

That is, we must determine whether the trial court's decision was "within the zone of reasonable disagreement" given the evidence presented at the suppression hearing and given the requirements of Rule 702. Montgomery v. State, 810 S.W.2d 372, 391 (Tex.Cr.App.1990);14 see also Duckett v. State, 797 S.W.2d at 913.

The trial court was, of course, the sole judge of the weight and credibility of the evidence presented at the suppression hearing. Viewing that evidence in the light most favorable to the trial court's decision, we conclude that it was demonstrated by clear and convincing evidence that the scientific principle underlying the RFLP technique was valid, that the RFLP technique itself was valid, that the technique was properly applied in this case, and that the related population frequency studies were also valid and reliable.

Moreover, there is nothing in the record to suggest that the probative value of the DNA evidence was outweighed by one of the Rule 403 factors. We conclude, therefore, that the trial court's decision to admit the DNA evidence was reasonable given the evidence presented at the suppression hearing and given the requirements of Rule 702.

The court of appeals did not err in its holding that the trial court did not abuse its discretion in admitting the DNA evidence. The judgment of the court of appeals is AFFIRMED.. DNA (deoxyribonucleic acid) is an “organic chemical of complex molecular structure that is found in all living cells and that codes genetic information for the transmission of inherited traits.” 4 Encyclopedia Britannica 140 (1990)..

In three grounds for review, appellant argues specifically that the “general acceptance" standard enunciated in Frye v. United States, 293 F. 1013 (D.C.Cir.1923), governs the admissibility of scientific evidence in Texas criminal trials and that the trial court erred in admitting DNA identification evidence at his trial because DNA evidence, according to appellant, is not generally accepted by the relevant scientific community..

Rule 104 provides in relevant part: (a) Preliminary questions concerning the... admissibility of evidence shall be determined by the court.... (c) Hearings on the admissibility of confessions shall in all cases be conducted out of the hearing of the jury. Hearings on other preliminary matters shall be so conducted when the interests of justice require..... Lifecodes Corporation, of Valhalla, New York, was the commercial biotechnology laboratory that conducted the DNA identification test in this case..

Technical details regarding the RFLP technique can he found in L. Kirby, DNA Fingerprinting (1990) and in U.S. Congress, Office of Technology Assessment, Genetic Witness: Forensic Uses of DNA Tests (July 1990).. In other words, the RFLP technique cannot determine whether two samples of DNA are actually identical. Rather, the technique reveals only whether the DNA molecules have certain common characteristics..

The State also points out that DNA identification evidence has been held admissible by virtually every appellate court that has considered the question. See, e.g., United States v. Jakobetz, 955 F.2d 786 (2d Cir.1992); Caldwell v. State, 393 S.E.2d 436 (Ga.1990); State v. Brown, 470 N.W.2d 30 (Iowa 1991); Smith v. Deppish, 248 Kan. 217, 807 P.2d 144 (1991); State v. Schwartz, 447 N.W.2d 422 (Minn.1989); State v. Ford, 301 S.C.

485, 392 S.E.2d 781 (1990); State v. Wimberly, 467 N.W.2d 499 (S.D.1991); Spencer v. Commonwealth, 238 Va. 275, 384 S.E.2d 775 (1989), cert. denied, 493 U.S. 1036, 110 S.Ct. 759, 107 L.Ed.2d 775 (1990).. See, e.g., Novak v. United States, 865 F.2d 718 (6th Cir.1989); United States v. Smith, 869 F.2d 348 (7th Cir.1989); State v. Schwartz, 447 N.W.2d 422 (Minn.1989); State v. Ford, 301 S.C.

485, 392 S.E.2d 781 (1990).. Because of its nature, scientific evidence will almost always be offered through the testimony of experts.. Rule 104(a) requires that the admissibility of expert testimony be determined by the trial court. See S. Goode, et al., Guide to the Texas Rules of Evidence § 702.2 at 501 (1988)..

Thus, Rule 702 incorporates Rule 402 and 403 analyses.."[Federal] Rule 702's failure to incorporate a general scientific acceptance standard, and the Advisory Committee Note's failure to even mention the Frye case must be considered significant.

The silence of the rule and its drafters may arguably be regarded as tantamount to an abandonment of the general acceptance standard." 3 J. Weinstein & M. Berger, Weinstein's Evidence para. 702[03] at 702-36 (1991). Cases utilizing a Rule 702-type relevancy test for the admissibility of scientific evidence in-*573elude, for example, United States v. Jakobetz, 955 F.2d 786 (2d Cir.1992); United States v. Williams, 583 F.2d 1194 (2d Cir.1978), cert. denied, 439 U.S. 1117, 99 S.Ct.

1025, 59 L.Ed.2d 77 (1979); DeLuca v. Merrell Dow Pharmaceuticals, 911 F.2d 941 (3d Cir.1990); State v. Brown, 470 N.W.2d 30 (Iowa 1991). Some jurisdictions hold that the relevancy test incorporates the Frye test. See, e.g., United States v. Two Bulls, 918 F.2d 56 (8th Cir.1990)..

In Bourjaily v. United States, 483 U.S. 171, 107 S.Ct. 2775, 97 L.Ed.2d 144 (1987), the United States Supreme Court concluded that all preliminary fact findings under Federal Rule of Evidence 104(a) are subject to the preponderance of the evidence (i.e., "more probable than not") burden of persuasion. See also Huddleston v. United States, 485 U.S. 681, 108 S.Ct.

1496, 99 L.Ed.2d 771 (1988). We need not decide today what burden of persuasion is applicable under Texas Rule of Criminal Evidence 702 when the scientific evidence proffered is not truly "novel.". In Montgomery v. State, we explained in some detail the appellate court function under an abuse of discretion standard.

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