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ESSAY

**A SHORT PRIMER ON THE ADMISSIBILITY OF FORENSIC
SCIENCE EVIDENCE IN TENNESSEE:
A CHECKLIST**

*Bernard A. Raum*¹

“[J]urors are quite capable of seeing through flaky testimony and pseudoscientific claptrap. . . . we should not waste our valuable time watching witch doctors, voodoo practitioners or *brujas* go through the entrails of dead chickens in a fruitless search for the truth.”²

For decades, aircraft pilots have been using pre-flight and approach-to-landing checklists rather than relying on their memory to ensure that everything has been done in its proper sequence. The use of this tool gives pilots the ability to fly their aircrafts safely and according to an established procedure. Similarly, most trial attorneys employ witness checklists during the in-court examination of their witnesses to ensure that all of the witnesses’ evidence has been fully presented and their exhibits have been properly marked and received in evidence. It is the intent of this presentation to suggest the use of another evidentiary checklist for attorneys: a forensic evidence admissibility checklist.

When confronted with proving or disproving facts at trial, many attorneys preliminarily conduct a mental checklist to determine whether each individual piece of

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² *People v. Williams*, 183 Cal. Rptr. 498, 502 (Cal. Ct. App. 1982) (Gardner, J. Concurring).

evidence, either physical or testimonial, is admissible. Often the answer is relatively simple, but finding that answer may be rather complicated with forensic science evidence; thus, the suggestion of a written checklist. If annotated at each stage, checklists such as this may also serve as the foundation for a memorandum to the court in support of either inclusion or exclusion of the particular evidence in question. An evidentiary checklist can be in any form that the attorney might prefer, but it should be short, using popular devices like talking point bullets. Each bullet then represents an admissibility hurdle that must be considered. The suggested bullets in this presentation are simply the rules of evidence themselves, listed in the logical order that the court will use to determine admissibility. At each point in the checklist where an admissibility issue arises, it is important to consider the relevant case law for meeting that rule's requirements.

THE CHECKLIST

I. The Discretion of the Court

The first consideration of admissibility for scientific evidence is the general proposition that it is the trial court that is vested with not only the authority but also the discretion to admit or exclude such evidence.³ Typically, the discussion regarding admissibility is not conducted within the hearing of the jury. Additionally, because of the

³ TENN. R. EVID. 104(a) ("Preliminary questions concerning the qualification of a person to be a witness, the existence of a privilege, or the admissibility of evidence shall be determined by the court, subject to the provisions of subdivision (b). In making its determination the court is not bound by the rules of evidence except those with respect to privileges."). *See, e.g.*, *State v. Ellwood*, 783 So. 2d 423, 427-430 (La. Ct. App. 2001) (where Dr. William Bass was qualified as an expert witness in the field of forensic anthropology).

potential for lengthy testimony and exhibits in the case of scientific evidence, the court's evidentiary hearing is often completed in advance of trial by way of a motion *in limine*.⁴ At any hearing concerning the admissibility of evidence, including scientific evidence, the proponent of that evidence bears the burden of proof by a preponderance of the evidence⁵ as to the underlying scientific principles and methodologies. The decision of the trial court to either admit or exclude evidence will not ordinarily be reversed on appeal unless the evidence preponderates otherwise,⁶

⁴ See, e.g., *Brown v. Crown Equip. Corp.*, 181 S.W.3d 268, 273 (Tenn. 2005); *State v. Scott*, 33 S.W.3d 74, 76 (Tenn. 2000); *Pimm v. Wickes Lumber Co.*, 845 S.W.2d 768, 769 (Tenn. Ct. App. 1992). Cf. *Pullum v. Robinette*, 174 S.W.3d 124, 139 (Tenn. Ct. App. 2004); *State v. Kiser*, No. E2005-02406-CCA-R3-DD, 2007 WL 4207903, at *374 (Tenn. Crim. App. 2007), *aff'd*, 284 S.W.3d 227 (Tenn. 2009).

⁵ *State v. Edison*, 9 S.W.3d 75, 77 (Tenn. 1999); *State v. Stamper*, 863 S.W.2d 404, 405 (Tenn. 1993).

⁶ See TENN. R. APP. P. 13. See, e.g., *McCutcheon v. TND Assocs., L.P.*, No. E2007-01073-COA-R3-CV, 2008 WL 1899984, at *2 (Tenn. Ct. App. 2008). (“In a non-jury case [. . .], we review the record de novo with a presumption of correctness as to the trial court's determination of facts, and we must honor those findings unless the evidence preponderates to the contrary. The trial court's conclusions of law are reviewed de novo and are accorded no presumption of correctness. A trial court's decisions regarding the admission of evidence will not be overturned absent a showing of abuse of discretion.”) (internal citations omitted). Under the abuse of discretion standard, a trial court ruling will not be disturbed if reasonable minds can disagree as to its propriety, and no abuse of discretion will be found unless the trial court applied an incorrect legal standard or reached a decision against logic or reasoning that causes an injustice to the party complaining. *Eldridge v. Eldridge*, 42 S.W.3d 82, 85 (Tenn. 2001). An abuse of discretion occurs when the lower court's decision is without a basis in law or fact and is therefore “arbitrary, illogical, or unconscionable.” *State v. Brown & Williamson Tobacco Corp.*, 18 S.W.3d 186, 191 (Tenn. 2000); see also *Edison*, 9 S.W.3d at 77; *State v. Odom*, 928 S.W.2d 18, 23 (Tenn. 1993).

where the trial court's discretion is arbitrarily exercised⁷ or is otherwise abused.⁸ In addition to the science involved, as part of this initial process the trial court will review the qualifications of any proposed expert witness.⁹

II. Relevance to the Inquiry

With this standard in mind, the next issue that a trial court will consider is whether the proposed evidence is relevant to the inquiry.¹⁰ If the evidence is not relevant, the inquiry stops there.¹¹ However, if the proposed evidence is deemed relevant, it is admissible, subject to other established rules of evidence and privilege.¹² The

⁷ *State v. Ballard*, 855 S.W.2d 557, 562 (Tenn. 1993); *Baggett v. State*, 421 S.W.2d 629, 632 (Tenn. 1967).

⁸ *Coe v. State*, 17 S.W.3d 193, 218 (Tenn. 2000).

⁹ *Brown v. Crown Equip.*, 181 S.W.3d at 274-75.

¹⁰ TENN. R. EVID. 401 (“‘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.”).

¹¹ *See State v. Mosley*, 200 S.W.3d 624, 630 (Tenn. Crim. App. 2005) (proffered testimony did not have any bearing on any fact that pertained to the defendant's guilt or innocence); *State v. Davis*, No. E2006-01450-CCA-R3-CD, 2007 WL 3245414, at *9 (Tenn. Crim. App. Nov. 5, 2007) (hypothetical question to an expert called for speculation).

¹² TENN. R. EVID. 402 (“All relevant evidence is admissible except as provided by the Constitution of the United States, the Constitution of Tennessee, these rules, or other rules or laws of general application in the courts of Tennessee. Evidence which is not relevant is not admissible.”). *See, e.g., State v. Matthews*, No. M2007-01755-CCA-R3-CD, 2009 WL 2391296, at *7 (Tenn. Crim. App. Aug. 5, 2009); *State v. Waggoner*, No. M2006-00553-CCA-R3-CD, 2007 WL 1341770, at *8 (Tenn. Crim. App. May 8, 2007); *Wicks v. Vanderbilt Univ.*, No. M2006-00613-COA-R3-CV, 2007 WL 858780, at *10 (Tenn. Ct. App. Mar. 21, 2007); *State v. Curtis*, No. W2006-02347-CCA-R3-CD, 2007 WL 4530821, at *12 (Tenn. Crim. App. Dec. 26, 2007). *See also* TENN. CODE ANN. § 24-1-201(b), which codifies the so-called spousal communication privilege.

requirements of this rule must be satisfied in order to admit the testimony of an expert witness or any scientific evidence.¹³ For example, in *State v. Odo*, the Tennessee Court of Criminal Appeals found relevant the testimony of Dr. William Bass, a forensic anthropologist at the University of Tennessee, who described wounds on the victim's skeleton as being consistent with the alleged murder weapon.¹⁴

In addition, the issue of relevance is often raised when the prosecution attempts to introduce autopsy photographs into evidence. In order for any photograph to be admissible, it must first accurately depict the scene.¹⁵ In Tennessee, the standard relevance rule for photographs is stated in *State v. Banks*: "The admissibility of photographs is a matter committed to the sound discretion of the trial court and will not be overturned on appeal without a clear showing of abuse of that discretion."¹⁶ Further, the Tennessee Supreme Court held that the admissibility of photographs of murder victims is within the discretion of the trial court after considering the relevance, probative value, and potential unfair prejudicial effect of such

¹³ *State v. Copeland*, 226 S.W.3d 287, 307 (Tenn. 2007) (admitting expert testimony for the defendant to determine the reliability of eyewitness identification); *State v. Ayers*, 200 S.W.3d 618, 622-23 (Tenn. Crim. App. 2005) (admitting expert testimony on gunshot residue patterns [GSR]); *State v. Price*, 46 S.W.3d 785, 809-10 (Tenn. Crim. App. 2000) (admitting DNA evidence). *Cf.* *State v. Campbell*, 904 S.W.2d 608 (Tenn. Crim. App. 1995) (denying admission of expert testimony from a psychologist regarding sexual abuse); *State v. Poole*, No. W2007-00447-CCA-R3-CD, 2009 WL 1025868, at *11 (Tenn. Crim. App. Apr. 14, 2009) (concluding that expert psychiatric testimony was irrelevant and inadmissible).

¹⁴ *State v. Oody*, 823 S.W.2d 554, 565-66 (Tenn. Crim. App. 1991).

¹⁵ *Phillips v. F.W. Woolworth Co.*, 867 S.W.2d 316, 318 (Tenn. Ct. App. 1992); *State v. Howard*, No. W2008-00208-CCA-R3-CD, 2009 WL 1034506, at *9 (Tenn. Crim. App. Apr. 17, 2009).

¹⁶ 564 S.W.2d 947, 949 (Tenn. 1978). *Banks* is the leading case in Tennessee regarding the admissibility of photographs.

evidence.¹⁷ Generally, “photographs of the corpse are admissible in murder prosecutions if they are relevant to the issues on trial, notwithstanding their gruesome and horrifying character.”¹⁸ The probative value of the evidence must be weighed against any unfair prejudice the defendant may suffer if the evidence is admitted, and the evidence may be excluded only if the unfair prejudice substantially outweighs the probative value.¹⁹ This rule has been applied in numerous circumstances, including determining admissibility of photographs of homicide victims and crimes scenes.²⁰

III. Exclusion of Relevant Evidence

There are occasions when evidence that is otherwise relevant is nonetheless subject to exclusion.²¹ For example,

¹⁷ State v. Blair, No. E2008-00073-CCA-R3-CD, 2009 Tenn. Crim. App. LEXIS 1032, at *22 (Tenn. Crim. App. Dec. 17, 2009) (paraphrasing *Banks*, 564 S.W.2d at 950-51).

¹⁸ *Id.* (quoting *Banks*, 564 S.W.2d at 950-51).

¹⁹ *Id.* (citing *Banks*, 564 S.W.2d at 951). See also State v. Vann, 976 S.W.2d 93, 102-03 (Tenn. 1998) (holding that the probative value in admitting a photograph depicting prior sexual abuse was not substantially outweighed by a danger of unfair prejudice); State v. Goodner, No. E2007-01048-CCA-R3-CD, 2009 WL 605141, at *23 (Tenn. Crim. App. Mar. 10, 2009) (concluding that admission of the victim’s photograph did not prejudice the defendant).

²⁰ State v. Carter, 114 S.W.3d 895, 903 (Tenn.2003) (concluding that photographs were relevant to establish the heinous, atrocious, or cruel aggravating circumstance of the murder); State v. Griffis, 964 S.W.2d 577, 594-95 (Tenn. Crim. App. 1997) (concluding that photographs showing the victim’s injuries were “relevant and highly probative”); State v. Hullom, No. M2006-01041-CCA-R3-CD, 2007 WL 1174904, at *4 (Tenn. Crim. App. Apr. 19, 2007) (concluding that photographs depicting injury to victim and bloody clothing were relevant); State v. Leverston, No. W2006-02304-CCA-R3-CD, 2007 WL 4245725, at *14 (Tenn. Crim. App. Dec. 3, 2007).

²¹ TENN. R. EVID. 403 (“Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair

admitting color photographs of a bruised, bloodied, nude, infant victim where the medical cause of death was not in dispute would be considered improper.²² The Tennessee Supreme Court has opined on the issue, saying:

Not all logically relevant evidence is admissible. Thus evidence, which would advance the inquiry but would also inflame or unduly distract the jury or require an undeserved expenditure of judicial time or unfairly surprise the opponent may not be admissible. The probative weight of evidence must be balanced against those attendant costs in determining that evidence should be admitted.²³

However, under TENNESSEE RULE OF EVIDENCE 704, testimony is not objectionable as evidence simply because it “embraces an ultimate issue to be decided by the trier of fact.”²⁴ Notwithstanding this provision, expert opinion testimony is “not admissible on an ultimate issue if the jury could readily draw its own conclusions on the matter without the aid of the witness’ opinion.”²⁵

prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence.”).

²² *State v. Collins*, 986 S.W.2d 13, 20-21 (Tenn. Crim. App. 1998); *see State v. Young*, 196 S.W.3d 85, 105-06 (Tenn. 2006) (holding that photograph of victim was prejudicial and inadmissible).

²³ *Otis v. Cambridge Mut. Fire Ins. Co.*, 850 S.W.2d 439, 443 (Tenn. 1992) (internal citation omitted).

²⁴ TENN. R. EVID. 704. *See State v. Shuck*, 953 S.W.2d 662, 668 (Tenn. 1997).

²⁵ *State v. Turner*, 30 S.W.3d 355, 360 (Tenn. Crim. App. 2000) (internal citations omitted).

IV. Testimony by Experts²⁶

Formerly, historical discomfort with expert testimony centered on unscrupulous persons who were charlatans²⁷ masquerading as experts. Of course, until the twentieth century, it was often difficult to verify the qualifications of these individuals. With a new focus on detailed record keeping and the ability to research the backgrounds of individuals, this evil has been substantially confined. However, the accuracy of the so-called science was usually left to the judgment and credibility of the individual expert witness, as evaluated by the jury.²⁸ The difficulty with this proposition was that neither the jury nor

²⁶ TENN. R. EVID. 702 (“If scientific, technical, or other specialized knowledge will substantially 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 in the form of an opinion or otherwise.”).

²⁷ “A person who makes elaborate, fraudulent, and often voluble claims to skill or knowledge. . . .” Dictionary.com, Charlatan, <http://dictionary.reference.com/browse/charlatan> (last visited Apr. 24, 2010). Synonyms: imposter, mountebank, fraud, phony, quack. *Id.* The term “charlatan” is apparently derived from the Italian word *ciarlatano* and originally referred to a native of the Umbrian village of Cerreto, which was known for its quacks. *Id.* The term later was used to describe those persons who set up booths in town squares to hawk remedies. See David Gentilcore, *Charlatans, Mountebanks and Other Similar People: The Regulation and Role of Itinerant Practitioners in Early Modern Italy*, 20 Soc. Hist. 297, 299 (1995) (noting that in city squares charlatans would “appear from all corners, performing tricks and skits, and selling trinkets and dubious remedies, all competing for the attention of the public”).

²⁸ *State v. Vasques*, 221 S.W.3d 514, 521 (Tenn. 2009) (“The credibility of the witnesses, the weight to be given their testimony, and the reconciliation of conflicts in the proof are matters entrusted to the jury as the trier of fact.”).

the judge in ruling on admissibility had any objective basis to determine the witness's scientific credibility.²⁹

The first real attempt to create some method for the court to gauge the validity of the science itself came in the watershed decision of the United States Court of Appeals for the District of Columbia in *Frye v. United States*.³⁰ The test for admissibility in *Frye* was a simple creation, implemented with no explanation by the court, and strictly involved determining if a consensus of the experts in a given field agreed that the science was valid.³¹ Thus, instead of relying upon the word of one expert, now the courts were asked to rely upon the words of a group of experts without any independent evaluation by the trier of fact.

The rapid advances and all-encompassing expansion of the scope and spectrum of the sciences in the last fifty years left the *Frye* standard behind. What the courts needed was a *methodology* of their own, in the language of the *courts*, that could be used to determine the validity of any scientific principle and its application to the particular issues in litigation. In 1993, the United States Supreme Court penned an elegant and insightful opinion in the case of *Daubert v. Merrell Dow Pharmaceuticals* that allowed a court for the first time to conduct its own independent review of the validity of a scientific principle before permitting a jury to hear any evidence based on the principle.³²

It is no mistake that the process outlined in *Daubert* closely mirrors the scientific method process that scientists themselves use to verify the validity of the results of their

²⁹ See *Frye v. United States*, 293 F.1013, 1014 (D.C. Cir 1923) (landmark case establishing an objective test for determining the admissibility of expert testimony).

³⁰ *Id.*

³¹ *Id.*

³² *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 592-94 (1993).

inquiries and their discoveries.³³ With this graceful leap, the courts were now able to view the actual making of the sausage. It was in this context that the Court in *Daubert* stated its goals:

The inquiry envisioned by [Federal Rule of Evidence] Rule 702 is, we emphasize, a flexible one. Its overarching subject is the scientific validity—and thus the evidentiary relevance and reliability—of the principles that underlie a proposed submission. The focus, of course, must be solely on principles and methodology, not on the conclusions that they generate.³⁴

As in any endeavor involving human interaction, the *Daubert* methodology is not foolproof; there are no absolute guarantees in the process. However, with the *Daubert* decision, the courts have moved much closer to today's scientific reality. With this background in mind, the next step is to examine the current framework for the treatment of expert testimony.

A. The Opinion Rule

Almost one hundred and twenty years ago in *Powers v. McKenzie*, the Supreme Court of Tennessee, in commenting on the qualifications of an expert witness as opposed to that of a lay witness, stated:

The true distinction between an expert and a non-expert witness, says Mr. Wharton, “is that the latter gives the results of a process of reasoning familiar to every-day life, and the former gives the

³³ *Id.* at 593.

³⁴ *Id.* at 594-95 (footnote omitted).

results of a process of reasoning which can be mastered only by special scientists.” It is obvious that, however an “expert” may be defined, he should, in order to give his opinion as an expert, have some special as well as practical acquaintance with the immediate line of inquiry. Where the line between an expert and a non-expert should be drawn must, under the varying conditions of cases and their environments, necessarily be laid down by the *judex fori*; and this court will not reverse on account of the judgment of the lower court as to whether a witness offered [to that court] is an expert, unless we can clearly see that he was in error in respect to the qualification of the witness, and that his error was injurious.³⁵

The modern Opinion Rule is based upon the common law “Opinion Rule,” sometimes called the “Pure Opinion Rule.” The Tennessee Supreme Court stated this rule succinctly only a few years after *Powers*:

While the general rule is that witnesses must speak to facts, yet, upon questions of skill or science, men who have made the subject matter of investigation the object of their particular study are competent to give their opinions in evidence. But they will not be permitted to state their opinion upon any point the jury has to decide. Deductions from facts belong to the jury, and

³⁵ 16 S.W. 559, 562 (Tenn. 1891). See *Otis*, 850 S.W.2d at 443 (“To give expert testimony, one must be particularly skilled, learned or experienced in a science, art, trade, business, profession or vocation. The expert must possess a thorough knowledge upon which he testifies that is not within the general knowledge and experience of the average person.”).

when the examination extends so far as to substitute the opinion of the witness, upon the very issue in controversy, for that of the jury, the province of that tribunal is unwarrantably invaded. *Necessity alone is the ground* upon which expert testimony rests, and the moment this necessity ceases, the exception to the general rule, which requires facts and not opinions from witnesses, ceases also. “Hence,” say the supreme court [sic] of Pennsylvania, in *Graham v. Penn Co.*, 139 Pa. 149, 21 A. 151 (Pa. 1891), “whenever the circumstances can be fully and adequately described to the jury, and are such that their bearing on the issue can be estimated by all men, without special knowledge or training, opinions of witnesses, experts or otherwise, are not admissible.”³⁶

Note, however, that the common law requirement of necessity has since been relaxed in Tennessee by the current provisions of Rule 702 of the Tennessee Rules of Evidence.³⁷ The requirement now is that such opinion testimony must *substantially assist* the trier of fact to understand the evidence or to determine a fact in issue.³⁸

Typically, a qualified expert may render an opinion, which is based upon his or her own training, education, and experience.³⁹ Under TENNESSEE RULE OF EVIDENCE 703,

³⁶ *Bruce v. Beall*, 41 S.W. 445, 448 (Tenn. 1897) (quoting *Graham v. Pennsylvania Co.*, 139 Ps. 149, 153 (Pa. 1891)) (emphasis added) (internal citation omitted). See, e.g., *Moon v. State*, 242 S.W. 39 (Tenn. 1921); *Fortune v. State*, 277 S.W.2d 381 (Tenn. 1955).

³⁷ See *State v. Shuck*, 953 S.W.2d 662, 668 (Tenn. 1997).

³⁸ *Id.* See also *State v. Campbell*, 904 S.W.2d 608, 616 (Tenn. Crim. App. 1995) (ruling that testimony of a psychologist would not “substantially assist” the trier of fact).

³⁹ *Hoy v. DRM, Inc.*, 114 P.3d 1268, 1282 (Wyo. 2005) (“If the [expert] witness is relying solely or primarily on experience, then the

this opinion may be based on what would otherwise be inadmissible hearsay⁴⁰ if “the type of hearsay is one that would be reasonably relied upon by experts in the situation.”⁴¹ It is, of course, this “basis of opinion” that is

witness must explain how that experience leads to the conclusion reached, why that experience is a sufficient basis for the opinion, and how that experience is reliably applied to the facts.”).

⁴⁰ TENN. R. EVID. 801(c) (“Hearsay’ is a statement, other than one made by the declarant while testifying at the trial or hearing, offered in evidence to prove the truth of the matter asserted.”). Hearsay is typically not admissible unless it falls under one of the established exceptions to the hearsay rule, delineated in TENN. R. EVID. 803, 804, and 805. *See, e.g.*, *State v. Williams*, 920 S.W.2d 247, 255-56 (Tenn. Crim. App. 1995) (admitting statements of a rape victim used in aid of medical treatment); *State v. Rucker*, 847 S.W.2d 512, 516 (Tenn. Crim. App. 1992) (admitting statements to a physician by a child abuse victim for treatment purposes). *But see Crawford v. Washington*, 541 U.S. 36, 68 (2004) (creating an exception to the admission of permissible hearsay where it would violate a criminal defendant’s Sixth Amendment right to confrontation and recognizing the concept of testimonial versus non-testimonial hearsay); *State v. Cannon*, 254 S.W.3d 287, 309 (Tenn. 2008) (holding that admission of the victim’s testimonial, out-of-court statements to an officer violated the defendant’s right of confrontation).

⁴¹ TENN. R. EVID. 703:

The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to the expert at or before the hearing. If of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject, the facts or data need not be admissible in evidence. Facts or data that are otherwise inadmissible shall not be disclosed to the jury by the proponent of the opinion or inference unless the court determines that their probative value in assisting the jury to evaluate the expert’s opinion substantially outweighs their prejudicial effect. The court shall disallow testimony in the form of an opinion or inference if the

the crux of credibility and weight of the evidence determinations by the jury. Additionally, in forming his or her opinion, the expert may rely upon input, opinion, or findings from other experts, as well as facts, which are brought to that expert's attention by investigators or are based on the expert's first-hand knowledge.⁴²

If the expert's opinion is based upon facts adduced through the employment of a scientific theory, process, procedure, technique or methodology, then that theory or methodology must comply with the relevant rules of evidence that control the admissibility of scientific evidence.⁴³ If, however, an expert's opinion is based on a scientific principle or methodology already judicially or statutorily recognized for producing reliable results, then there is no need for a trial court to determine the

underlying facts or data indicate lack of trustworthiness.

See State v. Kennedy, 7 S.W.3d 58, 66 (Tenn. Crim. App.1999):

Clearly, Rule 703 contemplates that inherently reliable information is admissible to show the basis for an expert's opinion, even if the information would otherwise constitute inadmissible hearsay. Indeed, it is not uncommon for an expert witness's opinion to be based on facts or data that are not admissible into evidence, but are reliable. In determining the reliability of the underlying information, that underlying data must be such that experts in that field reasonably rely on them in forming the same kinds of opinions or inferences that the expert in this case did. Thus, Tenn. R. Evid. 703 provides that an expert may base an opinion upon clearly inadmissible hearsay, if the type of hearsay is one that would be reasonably relied upon by experts in that situation.

⁴² *See* NEIL COHEN, SARAH Y. SHEPPARD, & DONALD F. PAINE, *TENNESSEE LAW OF EVIDENCE* 7-63 (Lexis Publishing 4th ed. 2000).

⁴³ *Id.* at 7-32.

admissibility of that evidence.⁴⁴ The court may simply take judicial notice of the reliability of that science.⁴⁵

⁴⁴ TENN. R. EVID. 201 states:

Judicial notice of adjudicative facts

- (a) Scope of Rule. This rule governs only judicial notice of adjudicative facts.
- (b) Kinds of Facts. A judicially noticed fact must be one not subject to reasonable dispute, in that it is either (1) generally known within the territorial jurisdiction of the trial court or (2) capable of accurate and ready determination by resort to sources whose accuracy cannot reasonably be questioned.
- (c) When Discretionary. A court may take judicial notice whether requested or not.
- (d) When Mandatory. A court shall take judicial notice if requested by a party and supplied with the necessary information.

See Fortune v. State, 277 S.W.2d 384, 385 (Tenn. 1955):

Generally speaking, judicial notice may be taken of any fact which is of common notoriety. The contrary of this is not so, however. A judge or juror cannot, in the name of judicial notice, substitute his own personal knowledge for evidence. There is a real distinction between a judge's personal knowledge as a private person, or knowledge acquired by him as a judge upon another trial, and his knowledge as a judge. As a judge, he should ignore what he knows as an individual or knowledge which has come to him upon another trial in which evidence was given to bring about that knowledge. Of course, no fixed rule can be laid down declaring what will be judicially noticed. In a general way courts will notice without evidence all facts that are part of the general knowledge of the country.

Nonetheless, the expert's opinion is subject to several challenges to its credibility: the underlying scientific theory, methodology, or laboratory analysis was not conducted properly; the individual laboratory analyst was not qualified to perform the testing or did not follow laboratory protocols; the laboratory was not certified or its quality control was deficient; the evidence being tested was not properly handled or stored—perhaps spoliation or alteration occurred; or the chain of custody of the evidence was compromised.⁴⁶ These direct challenges to an expert's opinion and thus to the expert's credibility should be conducted by cross-examination and by the production of countervailing evidence.⁴⁷ For the first time, jurors now

⁴⁵ See *Commonwealth v. Martin*, 290 S.W.3d 59, 66 (Ky. Ct. App. 2008); see, e.g., *United States v. Bonds*, 12 F.3d 540 (6th Cir. 1993) (the court approved the taking of judicial notice of the general acceptance of DNA and also offered an excellent early discussion of the analytical steps in the determination of the admissibility of scientific evidence in general); *Gordon's Transp. Inc. v. Bailey*, 294 S.W.2d 313, 333 (Tenn. Ct. App. 1956) (“[C]ourts will ordinarily take judicial notice of the operation and effect of natural laws and of nature's powers and forces, with the limitation that such notice is limited to those natural laws which are of universal occurrence, invariable in their action and of common knowledge.”) (internal citation omitted).

⁴⁶ TENN. R. EVID. 901(a) (“The requirement of authentication or identification as a condition precedent to admissibility is satisfied by evidence sufficient to the court to support a finding by the trier of fact that the matter in question is what its proponent claims.”). See, e.g., *State v. Cannon*, 254 S.W.3d 287 (Tenn. 2008); *State v. Rome*, No. W2006-00838-CCA-R3-CD, 2008 WL 2331018 (Tenn. Crim. App. June 5, 2008). Cf. *Scott*, 33 S.W.3d at 760 (“The purpose of the chain of custody requirement is to demonstrate that there has been no tampering, loss, substitution, or mistake with respect to the evidence. The identity of tangible evidence, however, need not be proven beyond all possibility of doubt, and the state is not required to establish facts which exclude every possibility of hampering.”) (internal citations omitted).

⁴⁷ See, e.g., *Fortune v. State*, 277 S.W.2d 381, 384 (Tenn. 1955) (“Thus when such [expert] witnesses are offered it will be a question of

have an objective standard to employ as they examine and gauge both the expert's credibility and the underlying scientific evidence.

B. The Impact of *Frye*⁴⁸ and *Daubert*⁴⁹

In light of the codification of Tennessee Rule of Evidence 702, the Supreme Court of Tennessee in 1997 determined that the admissibility test for scientific evidence announced in *Frye* was no longer applicable.⁵⁰ Instead, the Court in *McDaniel*, without having expressly adopted *Daubert*'s non-exclusive criteria, established a new test loosely based upon those considerations.⁵¹ The Court enumerated the new test as follows:

A Tennessee trial court may consider in determining reliability: (1) whether scientific evidence has been tested and the methodology with which it has been tested;⁵² (2) whether the evidence has been subjected to peer review or publication; (3) whether a potential rate of error is known; (4) whether, as formerly required by *Frye*, the evidence is generally accepted in the scientific community; and (5) whether the expert's research in the field has been conducted independent of litigation.⁵³

their credibility which of course is attacked by searching cross examination as to training, etc.").

⁴⁸ 293 F.1013 (D.C. Cir 1923).

⁴⁹ 509 U.S. 579 (1993).

⁵⁰ See *McDaniel v. CSX Transp., Inc.*, 955 S.W.2d 257, 262-64 (Tenn. 1997).

⁵¹ *Id.* at 265.

⁵² See *infra* Part IV-C for a discussion of the Scientific Method.

⁵³ *McDaniel*, 955 S.W.2d at 265.

The Court then offered further guidance for trial courts:

Although the trial court must analyze the science and not merely the qualifications, demeanor or conclusions of experts, the court need not weigh or choose between two legitimate but conflicting scientific views. The court instead must assure itself that the opinions are based on relevant scientific methods, processes, and data, and not upon an expert's mere speculation. . . .⁵⁴

We recognize that the burden placed on trial courts to analyze and to screen novel scientific evidence is a significant one. No framework exists that provides for simple and practical application in every case; the complexity and diversity of potential scientific evidence is simply too vast for the application of a single test.⁵⁵

Finally, the Court observed:

The trial court is not required to determine whether it agrees with the evidence and should not substitute its view for the trier of fact. It should allow the jury to consider legitimate but conflicting views about the scientific proof. Provided the evidence is scientifically valid, criticisms of it and opposing views may be elicited on cross-examination and/or established in the defendant's case.⁵⁶

⁵⁴ *Id.*

⁵⁵ *Id.*

⁵⁶ *Id.* at 266.

However, there is no requirement that all these factors be considered in each case before allowing expert testimony.⁵⁷

C. The Five *McDaniel* Factors

1. The Scientific Method

If it can be demonstrated that there has been strong adherence to the principles of the Scientific Method in the development of any scientific principle or methodology, then that principle or methodology can be considered reliable and any conclusions generated by it can be considered trustworthy.⁵⁸ This is the underlying focus of the decision in *Daubert*, in which the Court noted the scientific method as the hallmark of science.⁵⁹

The scientific method, a concept dating back at least to Sir Issac Newton's practices, is a process that is the basis for scientific inquiry. The scientific method follows a

⁵⁷ See *Brown v. Crown Equip.*, 181 S.W. 3d at 277 ("The rigid application of the *McDaniel* factors to all expert testimony is problematic because all expert testimony may not 'fit' within the factors."). See, e.g., *Chandler v. Cracker Barrel Old Country Store, Inc.*, No. E2006-00956-WC-R3-WC, 2007 WL 1710572, ** 4-6 (Tenn. Workers' Comp. Panel May 8, 2007).

⁵⁸ *Gentry v. Mangum*, 466 S.E.2d 171, 174 (W.Va. 1995).

⁵⁹ *Daubert*, 509 U.S. at 593:

Ordinarily, a key question to be answered in determining whether a theory or technique is scientific knowledge that will assist the trier of fact will be whether it can be (and has been) tested. "Scientific methodology today is based on generating hypotheses and testing them to see if they can be falsified; indeed, this methodology is what distinguishes science from other fields of human inquiry."

(quoting E. GREEN & C. NEESON, PROBLEMS, CASES, AND MATERIALS ON EVIDENCE 645 (1983)).

series of steps: (1) identify a problem that needs to be solved, (2) formulate a hypothesis, (3) test the hypothesis, (4) collect and analyze the data, and (5) make conclusions.⁶⁰ It is, therefore, no accident that great deference is given to the application of the scientific method in various disciplines within the field of forensic science. For example, in fire and arson investigations, the well-recognized National Fire Protection Association (NFPA), in its authoritative *Guide for Fire and Explosion Investigations* series, commences its in-depth discussion of the topic with a chapter offering detailed instruction to investigators on the applicability and use of the scientific method.⁶¹ Compliance with the procedures in the NFPA guide has formed the basis for admissibility of scientific fire and arson evidence in numerous cases around the United States.⁶² In addition, there are various published standards, which establish protocols and methodologies that are generally accepted within the worldwide scientific and industrial community.⁶³ It has also been suggested that where there is no scientific consensus among respected, well-credentialed scientists as to what is and what is not “good science,” the court’s responsibility might be to

⁶⁰ Labwrite Glossary, <http://www.ncsu.edu/labwrite/res/res-glossary.html> (last visited Mar. 2, 2010).

⁶¹ NFPA 921: GUIDE FOR FIRE & EXPLOSION INVESTIGATIONS ch. 4 (2008).

⁶² See, e.g., ANDRE A. MOENSSENS, ET AL., SCIENTIFIC EVIDENCE IN CIVIL AND CRIMINAL CASES 1274-78 (5th ed. 2007) (discussing the scientific method as it relates to the field of behavioral sciences).

⁶³ See ASTM International, <http://www.astm.org> (last visited Mar. 2, 2010). With the active participation of members of the scientific, legal, and educational communities, including members of the American Academy of Forensic Sciences, ASTM has established and published standards, which are applicable to the forensic sciences as well. *Id.* See also *Turner v. State*, 746 So. 2d 355 (Ala. 1998).

occasionally reject such expert testimony because it was not “derived by the scientific method.”⁶⁴

2. Peer Review or Publication

Commenting upon the concept of peer review, the Court in *Daubert* observed:

Another pertinent consideration is whether the theory or technique has been subjected to peer review and publication. Publication (which is but one element of peer review) is not a *sine qua non* of admissibility; it does not necessarily correlate with reliability, and in some instances well-grounded but innovative theories will not have been published. Some propositions, moreover, are too particular, too new, or of too limited interest to be published. But submission to the scrutiny of the scientific community is a component of “good science,” in part because it increases the likelihood that substantive flaws in methodology will be detected. The fact of publication (or lack thereof) in a peer reviewed journal thus will be a relevant, though not dispositive, consideration in assessing the scientific validity of a particular technique or methodology on which an opinion is premised.⁶⁵

It has been said that “[t]he role of peer review is ‘to promote the publication of well-conceived articles so that the most important review, the consideration of the reported results by the scientific community, may occur

⁶⁴ *Daubert*, 43 F.3d at 1316.

⁶⁵ *Id.* at 593-94 (internal citations omitted). See, e.g., 1 PAUL C. GIANNELLI & EDWARD J. IMWINKELRIED, SCIENTIFIC EVIDENCE § 1.08, 43-44 (4th ed. 2007).

after publication.”⁶⁶ Further, that peer review “means publication in a *refereed* journal, such as SCIENCE, NATURE, or the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION.”⁶⁷ Note, however, that the lack of peer review does not necessarily render an expert’s opinion unreliable.⁶⁸

3. Potential Rate of Error

The potential false positive rate of error of a scientific technique or test is significant in the forensic science context, while a false negative rate of error is important in the overall state of the science involved.⁶⁹ The existence of a known rate of error “is not a prerequisite under Tennessee law for the admission of expert testimony but is one of many considerations that the court may consider in its gate keeping functions.”⁷⁰ However, the Court advised in *Daubert* that “[I]n the case of a particular scientific technique, the court ordinarily should consider the known or potential rate of error, and the existence and maintenance of standards controlling the technique’s operation.”⁷¹ On remand of *Daubert*, the Ninth Circuit observed:

Peer review and publication do not, of course, guarantee that an expert’s conclusions reached are correct; much published scientific research is greeted with intense skepticism and is not borne out by further research. But the test under *Daubert* is not the correctness of the expert’s

⁶⁶ 1 GIANNELLI & IMWINKELRIED, *supra* note 60, § 1.08, at 44-45.

⁶⁷ *Id.* at 45-46.

⁶⁸ *Brown v. Crown Equip.*, 181 S.W. 3d at 278.

⁶⁹ 1 GIANNELLI & IMWINKELRIED, *supra* note 65, § 1.08, at 46-47.

⁷⁰ *Chandler*, 2007 WL 1710572 at *6.

⁷¹ *Daubert*, 509 U.S. at 594.

conclusions but the soundness of his methodology. That the research is accepted for publication in a reputable scientific journal after being subjected to the usual rigors of peer review is a significant indication that it is taken seriously by other scientists, i.e., that it meets at least the minimal criteria of good science. If nothing else, peer review and publication “increase the likelihood that substantive flaws in methodology will be detected.”⁷²

It should be noted that where the legislature has established the admissibility of a particular scientific test, the failure of the legislature to consider any known rate of error apparently does not impinge on the admissibility of any test results.⁷³

4. General Acceptance in the Scientific Community

This standard is, of course, the *Frye* standard.⁷⁴ By specifically adopting this standard, the Tennessee Supreme

⁷² *Daubert v. Merrell Dow Pharmaceuticals*, 43 F.3d 1311, 1318 (9th Cir. 1995) (internal citations omitted).

⁷³ *Cribbs v. State*, No. W2006-01381-CCA-R3-PD, 2009 WL 1905454, at *40 (Tenn. Crim. App. July 1, 2009).

⁷⁴ *See Frye*, 293 F. at 1014:

“The rule is that the opinions of experts or skilled witnesses are admissible in evidence in those cases in which the matter of inquiry is such that inexperienced persons are unlikely to prove capable of forming a correct judgment upon it, for the reason that the subject-matter so far partakes of a science, art, or trade as to require a previous habit or experience or study in it, in order to acquire a knowledge of it. When the question involved does not lie within the range of common experience or common knowledge,

Court implicitly adopted all pre-existing case law in Tennessee that interpreted and applied the *Frye* rule. As observed by the United States Supreme Court in *Daubert*:

“[G]eneral acceptance” can yet have a bearing on the inquiry. A “reliability assessment does not require, although it does permit, explicit identification of a relevant scientific community and an express determination of a particular degree of acceptance within that community.” Widespread acceptance can be an important factor in ruling particular evidence admissible, and “a known technique which has been able to attract only minimal support within the community,” may properly be viewed with skepticism.⁷⁵

Many reported opinions discuss the testimonies of forensic anthropologists. The subject matter of these testimonies

but requires special experience or special knowledge, then the opinions of witnesses skilled in that particular science, art, or trade to which the question relates are admissible in evidence.”

Numerous cases are cited in support of this rule. 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.*

Id. (quoting Appellant’s Brief) (emphasis added).

⁷⁵ 509 U.S. at 594 (quoting *United States v. Downing*, 753 F.2d 1224, 1238) (3d Cir. 1985) (internal citations omitted).

ranges over multiple factual areas, such as specific identification of the decedent, including age, gender, stature, and race;⁷⁶ identification of a defendant from a photograph or surveillance video,⁷⁷ using ear⁷⁸ and facial recognition points;⁷⁹ the comparison of weapons with wound patterns,⁸⁰ describing a skull fracture⁸¹ or that a head wound was consistent with a gunshot;⁸² method of disposal of a body;⁸³ time of death;⁸⁴ and cause of death.⁸⁵ Unfortunately, the vast majority of these opinions do not discuss the admissibility of such testimony *vel non*,⁸⁶ but

⁷⁶ See, e.g., *State v. Klindt*, 389 N.W.2d 670, 673 (Iowa 1986).

⁷⁷ *State v. Douglas*, 203 Conn. 445, 450 (Conn. 1987); *Penalver v. State*, 926 So.2d 1118, 1134 (Fla. 2006).

⁷⁸ *United States v. McClintock*, No. 05-441, 2006 WL 39241, at *6 (E.D. Pa. Jan. 5, 2006).

⁷⁹ *United States v. Fadayini*, 28 F.3d 1236, 1240-41 (D.C. Cir. 1994).

⁸⁰ *Colina v. State*, 634 So. 2d 1077, 1081 (Fla. 1994); *People v. St. Pierre*, 522 N.E.2d 61, 64 (Ill. 1988).

⁸¹ *St. Pierre*, 522 N.E.2d at 61.

⁸² *State v. Fasola*, 901 So.2d 533, 537 (La. Ct. App. 2005).

⁸³ *Tamme v. Commonwealth*, 973 S.W.2d 13, 36 (Ky. 1998).

⁸⁴ *State v. Phillips*, 659 So.2d 785, 788 (La. Ct. App. 1995).

⁸⁵ See *Wuornos v. State*, 644 So. 2d 1012, 1019 (Fla. 1994).

⁸⁶ For some recent Tennessee cases where the testimony of forensic anthropologists was received apparently under the “Opinion Rule,” see *Dellinger v. State*, 279 S.W.3d 282, 289-90 (Tenn. 2009) (Dr. William Bass’s testimony regarding time of death); *State v. Rogers*, 188 S.W.3d 593, 600 (Tenn. 2006) (Dr. Murray Marks found no evidence of trauma as would be expected had a car run over the victim); *State v. Davidson*, 121 S.W.3d 600, 606 (Tenn. 2003) (Dr. Murray Marks testified that trauma to the body was inconsistent with animal activity and also testified regarding the time of death); *State v. Bondurant*, 4 S.W.3d 662, 665 (Tenn. 1999) (Dr. William Bass “testified that he was 100 percent certain that the bones were human, 75 percent certain that they came from a male, over 50 percent certain that blunt trauma had been applied to the skull before it had been burned, and 90 percent certain that the bones had been in the ground no less than one nor more than fifteen to twenty years.”); *State v. Cross*, No. 03C01-9810-CR-00358, 1999 WL 1076958, at *5 (Tenn. Crim. App. Nov. 30, 1999) (Dr. William Bass identified the victim, trauma to victim’s skull, and

some cases do address this issue.⁸⁷ Needless to say, the reports of forensic anthropologists have been used by medical examiners and coroners to formulate their opinions on the time of death and the cause and manner of death.⁸⁸

5. Research Independent of Litigation

“The objective of the trial court’s gate keeping function is to ensure that ‘an expert, whether basing testimony upon professional studies or personal experience, employs in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field.’”⁸⁹ On remand from the United States Supreme Court, the Ninth Circuit in *Domingo* stated, “this court [has] explained that, if an expert did not conduct his or her own *research, independent of the litigation*, on the subject of the testimony, the district court must determine

identity of the murder weapon as a shotgun); *State v. Oody*, 823 S.W.2d 554, 558 (Tenn. Crim. App. 1991) (Dr. William Bass testified that wounds on a skeleton were consistent with a particular ax); *State v. Phillips*, 728 S.W.2d 21, 24 (Tenn. Crim. App. 1986) (Dr. William Bass testified regarding the victim’s time of death and two gunshot wounds to the victim’s head, whom he identified using known x-rays); *State v. Driver*, 634 S.W.2d 601, 604-05 (Tenn. Crim. App. 1981) (Dr. William Bass testified that scattered bones were that of the 17-year-old victim, whom he identified using dental charts).

⁸⁷ See, e.g., *State v. Miller*, 429 N.W.2d 26, 39-40 (S.D. 1988). The court addressed the admissibility of a forensic anthropologist’s testimony as to the type of instrument used to inflict certain head wounds on the decedent, ruling that based upon the expert’s experience and education, such testimony was admissible under *Frye*. *Id.*

⁸⁸ See, e.g., *Linn v. Fossum*, 946 So.2d 1032 (Fla. 2006).

⁸⁹ *Brown v. Crown Equip.*, 181 S.W.3d at 275 (quoting *Kumho Tire Co. v. Carmichael* 526 US 137, 152 (1999)).

whether there exists any “objective, verifiable evidence that the testimony is based on ‘scientifically valid principles.’”⁹⁰

The Ninth Circuit explained in *Daubert*:

One very significant fact to be considered is whether the experts are proposing to testify about matters growing naturally and directly out of research they have conducted independent of the litigation, or whether they have developed their opinions expressly for purposes of testifying. That an expert testifies for money does not necessarily cast doubt on the reliability of his testimony, as few experts appear in court merely as an eleemosynary gesture. But in determining whether proposed expert testimony amounts to good science, we may not ignore the fact that a scientist’s normal workplace is the lab or the field, not the courtroom or the lawyer’s office.⁹¹

The decisions in *Daubert* and *McDaniel* have given Tennessee courts a methodology for determining the validity and relevance of both scientific principles and the experts who purport to know and apply them.

V. Conclusion

In summary, here is how an attorney’s checklist for the admissibility of forensic evidence might look:

⁹⁰ *Domingo v. T.K.*, 289 F.3d 600, 606 (9th Cir. 2002) (quoting *Daubert v. Merrell Dow Pharms., Inc.*, 43 F.3d 1311, 1317-18 (9th Cir. 1995)) (emphasis added).

⁹¹ *Daubert*, 43 F.3d at 1317.

- Admissibility is at the discretion of the court. *See* TENN. R. EVID. 104.
- Proposed evidence must be relevant to the inquiry. *See* TENN. R. EVID. 401, 402.
- Relevant evidence may still be subject to exclusion. *See* TENN. R. EVID. 403, 801, 803, 804, 805.
- Expert testimony to scientific knowledge that is not subject to judicial notice is subject to a scientific credibility analysis. *See* TENN. R. EVID. 201, 901.
 - ✓ The Opinion Rule—*see* TENN. R. EVID. 702, 703, 704.
 - ✓ *Daubert* Criteria—*see* 509 U.S. 579 (1993).
 - ✓ *McDaniel* Factors—*see* 955 S.W.2d 257, 262-64 (Tenn. 1997).
 1. The Scientific Method
 2. Peer Review or Publication
 3. Potential Rate of Error
 4. General Acceptance in the Scientific Community
 5. Research Independent of Litigation

Every lawyer and judge should be using a subconscious checklist in preparing and reviewing forensic evidence, but when preparing for trial, a written evidentiary checklist, such as the one described here, can help to ensure that evidence vital to your case is given the credibility it deserves.