

## CRIMINAL EVIDENCE: EXPERT TESTIMONY

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- I. **Introduction.** This chapter discusses the admissibility of expert testimony under North Carolina's amended Evidence Rule 702. The 2011 amendments to subsection (a) of the rule adopted the federal standard for the admission of expert testimony, as articulated in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), *General Electric Co. v. Joiner*, 522 U.S. 136 (1997), and *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999). *State v. McGrady*, 368 N.C. 880, 884 (2016). Before the rule was amended, making North Carolina a "Daubert state," the standard for admissibility of expert testimony came from a case called *Howerton v. Arai Helmet, Ltd.*, 358 N.C. 440 (2004). Under both the *Daubert* and *Howerton* tests, the trial court determines admissibility of expert testimony by examining relevancy, qualifications, and reliability. *McGrady*, 368 N.C. at 892. However, under the *Daubert* standard the trial court applies a more rigorous reliability analysis. *Id.*; see also *State v. Turbyfill*, \_\_\_ N.C. App. \_\_\_, 776 S.E.2d 249, 257 (2015) (*Daubert* is a "heightened" standard). In its discussion of the reliability prong of the analysis, this chapter focuses on the new *Daubert* standard.

For discussion of the proper scope of expert testimony in sexual assault cases, see [Evidence Issues in Criminal Cases Involving Child Victims and Child Witnesses](#) in this Benchbook.

For a discussion of Confrontation Clause issues that can arise with respect to expert testimony, see [Guide to Crawford and the Confrontation Clause](#) in this Benchbook.

For a discussion of what discovery must be provided in connection with expert witnesses, see [Discovery in Criminal Cases](#) in this Benchbook.

The text of Rule 702 is set out immediately below.

Rule 702. Testimony by experts

(a) 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, if all of the following apply:

- (1) The testimony is based upon sufficient facts or data.
- (2) The testimony is the product of reliable principles and methods.
- (3) The witness has applied the principles and methods reliably to the facts of the case.

(a1) A witness, qualified under subsection (a) of this section and with proper foundation, may give expert testimony solely on the issue of impairment and not on the issue of specific alcohol concentration level relating to the following:

- (1) The results of a Horizontal Gaze Nystagmus (HGN) Test when the test is administered by a person who has successfully completed training in HGN.
- (2) Whether a person was under the influence of one or more impairing substances, and the category of such impairing substance or substances. A witness who has received training and holds a current certification as a Drug Recognition Expert, issued by the State Department of Health and Human Services, shall be qualified to give the testimony under this subdivision.

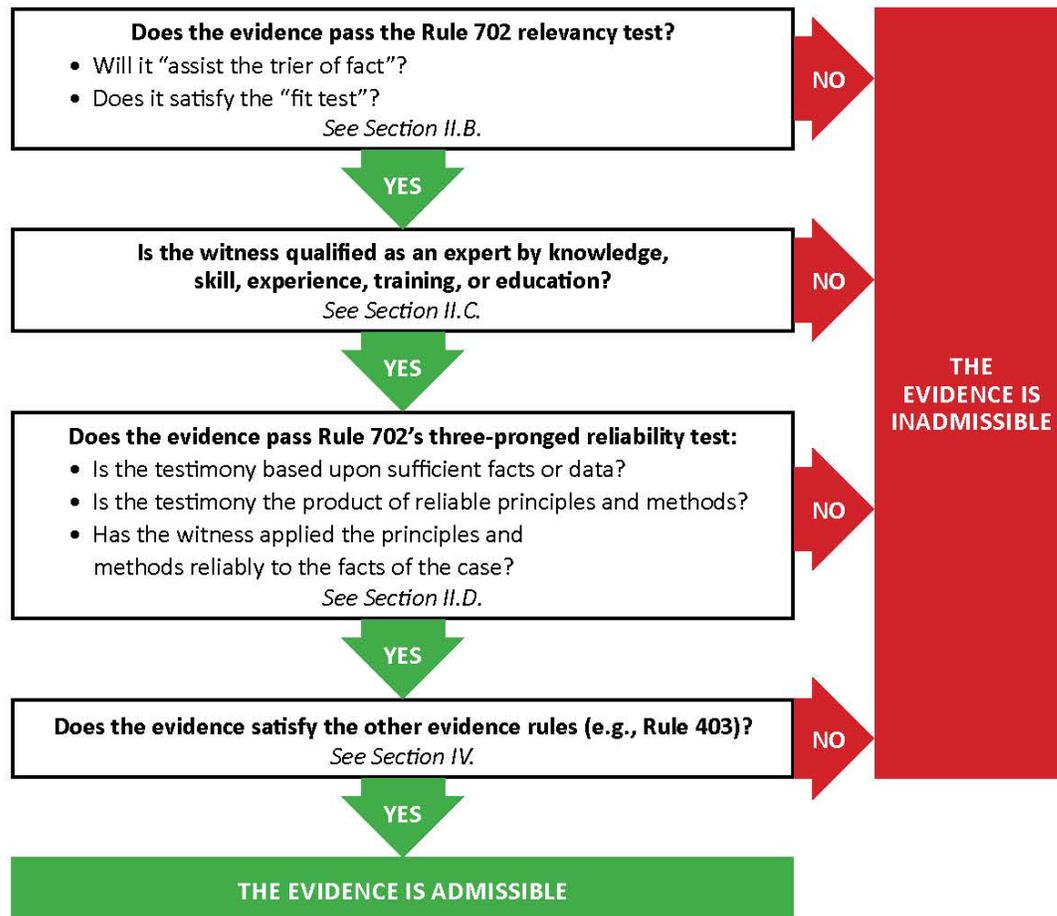
*[subsections (b)-(f), dealing with medical malpractice cases, are not reproduced here]*

(g) This section does not limit the power of the trial court to disqualify an expert witness on grounds other than the qualifications set forth in this section.

*[subsection (h), which deals with medical malpractice cases, is not reproduced here]*

(i) A witness qualified as an expert in accident reconstruction who has performed a reconstruction of a crash, or has reviewed the report of investigation, with proper foundation may give an opinion as to the speed of a vehicle even if the witness did not observe the vehicle moving.

Figure 1. Analysis for Determining Admissibility of Expert Testimony



## II. Standard for Admissibility under Rule 702(a).

A. **Generally.** As illustrated in Figure 1 above, Evidence Rule 702(a) sets forth a three-step framework for determining the admissibility of expert testimony: relevance, qualifications, and reliability, where reliability is assessed under the stricter *Daubert* standard rather than the old *Howerton* standard. *See supra* Section I.

1. ***Daubert, Joiner & Kumho Tire.*** The “*Daubert* standard” refers to a standard of admissibility laid out by the United States Supreme Court in a trio of cases: *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), *General Electric Co. v. Joiner*, 522 U.S. 136 (1997), and *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999). Those three foundational cases are summarized here.

*Daubert* was a civil case in which children and their parents sued to recover for birth defects allegedly sustained because the mothers had taken Bendectin, a drug marketed by the defendant pharmaceutical company. The defendant moved for summary judgment, arguing that the

drug does not cause birth defects in humans and that the plaintiffs could not present admissible evidence establishing otherwise. The defendant supported its motion with an expert's affidavit concluding that Bendectin has not been shown to be a risk factor for human birth defects. The plaintiffs countered with eight experts; each of whom concluded that Bendectin can cause birth defects. The experts' conclusions were based on animal studies; pharmacological studies purporting to show that Bendectin's chemical structure was similar to that of other substances known to cause birth defects; and the "reanalysis" of previously published human statistical studies. Relying on the "general acceptance" test for admission of scientific evidence formulated in *Frye v. United States*, 293 F. 1013 (1923), the trial court found that because it was not generally accepted as reliable in the relevant scientific community the plaintiffs' expert evidence was inadmissible and granted the defendant's motion for summary judgment. After the Ninth Circuit affirmed, the United States Supreme Court agreed to hear the case, to resolve a split among the courts regarding whether the "general acceptance" test was the proper standard for admission of expert testimony.

The Court began by holding that the *Frye* "general acceptance" test for admission of expert testimony was superseded by the adoption of the Federal Rules of Evidence. Addressing the standard for admissibility under Rule 702, the Court stated that to qualify as "scientific knowledge," an inference or assertion must be derived by the scientific method. 509 U.S. at 590. It explained: "[T]he requirement that an expert's testimony pertain to 'scientific knowledge' establishes a standard of evidentiary reliability." *Id.* The Court continued, noting that Rule 702 "further requires that the evidence or testimony 'assist the trier of fact to understand the evidence or to determine a fact in issue,'" a condition going primarily to relevance. *Id.* at 591. It clarified: "Expert testimony which does not relate to any issue with the case is not relevant and, ergo, non-helpful." *Id.* (quotation omitted). This prong of the admissibility analysis, it noted, has been described as one of "fit." *Id.* It continued:

Faced with a proffer of expert scientific testimony . . . , the trial judge must determine at the outset, pursuant to Rule 104(a), whether the expert is proposing to testify to (1) scientific knowledge that (2) will assist the trier of fact to understand or determine a fact in issue. This entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue.

*Id.* at 592–93 (footnotes omitted). The Court noted that many factors will bear on the inquiry and that it would not "presume to set out a definitive checklist or test." *Id.* at 593. However, it went on to offer five "general observations" relevant to the analysis:

1. A "key question" is whether the theory or technique can be (and has been) tested. *Id.* ("Scientific methodology . . . 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” (quotation omitted)).
2. Whether the theory or technique has been subjected to peer review and publication. *Id.* The Court noted that publication (one element of peer review) is not a “sine qua non of admissibility;” publication does not necessarily correlate with reliability, and in some cases well-grounded but innovative theories will not have been published. *Id.* It explained: “Some propositions . . . 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.” *Id.* Thus, “[t]he fact of publication (or lack thereof) in a peer reviewed journal . . . 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.” *Id.* at 594.
  3. The theory or technique’s known or potential rate of error. *Id.* at 594.
  4. The existence and maintenance of standards controlling the technique’s operation. *Id.*
  5. The “general acceptance” of the theory or technique. *Id.* at 594. The Court explained:

“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.”

*Id.* (quotations and citations omitted).

The Court was careful to note that the inquiry to be applied by the trial court in its “gatekeeping role,” *id.* at 597, is “a flexible one” in which the focus “must be solely on principles and methodology, not on the conclusions that they generate.” *Id.* at 594-95. In the end, the Court remanded for further proceedings consistent with the new test for admissibility. *Id.* at 597-98.

The second case in the *Daubert* trilogy was *Joiner*, another civil case. *Joiner*, 522 U.S. 136. Its main contribution to the trilogy is to establish that a trial court’s decision to admit or exclude expert testimony under Federal Rule 702 is reviewed under an abuse of discretion standard and to illustrate application of that standard to a trial court’s exclusion of expert testimony. In *Joiner*, an electrician who had lung cancer sued the manufacturer of PCBs and the manufacturers of electrical transformers and dielectric fluid for damages. The plaintiff, who

was a smoker and had a family history of lung cancer, claimed that his exposure on the job to PCBs and their derivatives promoted his cancer. In deposition testimony, the plaintiff's experts opined that his exposure to PCBs was likely responsible for his cancer. The district court found the testimony from these experts to be inadmissible and granted the defendants' motion for summary judgment. The Eleventh Circuit reversed and the Supreme Court granted certiorari.

The Court held that a trial court's decision to admit or exclude expert testimony will be reviewed under an abuse of discretion standard and that here, no abuse of discretion occurred. *Id.* at 143. The plaintiff proffered the deposition testimony of two expert witnesses: (1) Dr. Arnold Schecter, who testified that he believed it "more likely than not that [the plaintiff's] lung cancer was causally linked to cigarette smoking and PCB exposure;" and (2) Dr. Daniel Teitlebaum, who testified that the plaintiff's "lung cancer was caused by or contributed to in a significant degree by the materials with which he worked." *Id.* The defendants asserted that the experts' statements regarding causation were speculation, unsupported by epidemiological studies and based exclusively on isolated studies of laboratory animals. *Id.* The plaintiff responded, claiming that his experts had identified animal studies to support their opinions and directing the court to four epidemiological studies relied upon by his experts. *Id.* at 143-44. The district court had agreed with the defendants that the animal studies did not support the plaintiff's contention that PCB exposure contributed to his cancer. *Id.* at 144. The studies involved infant mice that developed cancer after being exposed to massive doses of concentrated PCBs injected directly into their bodies. *Id.* The plaintiff, by contrast, was an adult human whose alleged exposure was far less and in lower concentrations. *Id.* Also, the cancer that the mice developed was different than the plaintiff's cancer, no study demonstrated that adult mice developed cancer after being exposed to PCBs, and no study demonstrated that PCBs lead to cancer in other species. *Id.* The Court concluded: "[t]he studies were so dissimilar to the facts presented in this litigation that it was not an abuse of discretion for the District Court to have rejected the experts' reliance on them." *Id.* at 144-45.

The trial court also had concluded that the epidemiological studies were not a sufficient basis for the experts' opinions. After reviewing the studies, the Court found that they did not sufficiently suggest a link between the increase in lung cancer deaths and exposure to PCBs. *Id.* at 145-46. The Court went on to disagree with the plaintiff's assertion that *Daubert* requires a focus "solely on principles and methodology," not the conclusions that they generate, and that the trial court erred by focusing on the experts' conclusions, stating:

[C]onclusions and methodology are not entirely distinct from one another. Trained experts commonly extrapolate from existing data. But nothing in either *Daubert* or the Federal Rules of Evidence requires a district court to admit opinion evidence that is connected to existing data only by the ipse dixit of the expert. A court may conclude that there is simply too great an analytical gap between the data and the opinion proffered.

*Id.* at 146. The Court went on to hold that the trial court did not abuse its discretion by concluding that the studies on which the experts relied were not sufficient to support their conclusions that the plaintiff's exposure to PCBs contributed to his cancer. *Id.* at 146-47.

The final case in the trio was *Kumho Tire*, 526 U.S. 137. It answered a question left open by *Daubert*: Does the *Daubert* standard apply only to "scientific" expert testimony or to all expert testimony, including testimony based on technical or other specialized knowledge? The Court held that the test applies to *all* expert testimony. In *Kumho Tire* the Court also clarified the nature of the *Daubert* inquiry.

In *Kumho Tire*, the plaintiffs brought a products liability action against a tire manufacturer and distributor for injuries sustained when a vehicle tire failed. The plaintiffs rested their case on deposition testimony provided by an expert in tire failure analysis, Dennis Carlson. Carlson's testimony accepted certain background facts about the tire in question, including that it had traveled far; that the tire's tread depth had been worn down to depths that ranged from 3/32 of an inch to zero; and that the tire tread had at least two inadequately repaired punctures. Despite the tire's age and history, Carlson concluded that a defect in the tire's manufacture or design caused the blowout. His conclusion rested on several undisputed premises, including that the tread had separated from the inner carcass and that this "separation" caused the blowout. *Id.* at 143-44. However, his conclusion also rested on several disputed propositions. First, Carlson said that if a separation is not caused by a kind of misuse called "overdeflection" then ordinarily its cause is a tire defect. Second, that if a tire has been subject to sufficient overdeflection to cause a separation, it should reveal certain symptoms, which he identified. Third, that where he does not find at least two such symptoms, he concludes that a manufacturing or design defect caused the separation. Carlson conceded that the tire showed a number of symptoms, but in each instance he found them to be not significant and he explained why he believed they did not reveal overdeflection. He thus concluded that a defect must have caused the blowout.

The defendant moved to exclude Carlson's testimony on the ground his methodology failed Rule 702's reliability requirement. The trial court conducted a *Daubert* reliability analysis and granted the motion to exclude. The Eleventh Circuit reversed, holding that the *Daubert* analysis only applied to scientific evidence. The United States Supreme Court granted certiorari to resolve the question of whether or how *Daubert* applies to expert testimony based not on "scientific" knowledge but on "technical" or "other specialized" knowledge.

The Supreme Court began by holding that the *Daubert* standard applies to all expert testimony, not just scientific testimony. *Id.* at 147-49. It went on to hold that when determining the admissibility of the expert testimony at issue--engineering testimony--the trial court *may* consider the five *Daubert* factors: whether the theory or technique can and has been tested; whether it has been subjected to peer review and publication; the theory or technique's known or potential rate of error; whether there are standards controlling its operation; and whether the theory or technique enjoys general acceptance within the relevant

scientific community. *Id.* at 149-50. Emphasizing the word “may” in this holding, the Court explained:

Engineering testimony rests upon scientific foundations, the reliability of which will be at issue in some cases. In other cases, the relevant reliability concerns may focus upon personal knowledge or experience. . . . [T]here are many different kinds of experts, and many different kinds of expertise. . . . We agree . . . that “[t]he factors identified in *Daubert* may or may not be pertinent in assessing reliability, depending on the nature of the issue, the expert's particular expertise, and the subject of his testimony.” The conclusion, in our view, is that we can neither rule out, nor rule in, for all cases and for all time the applicability of the factors mentioned in *Daubert*, nor can we now do so for subsets of cases categorized by category of expert or by kind of evidence. Too much depends upon the particular circumstances of the particular case at issue.

*Id.* at 150 (quotations and citations omitted). It continued:

*Daubert* . . . made clear that its list of factors was meant to be helpful, not definitive. Indeed, those factors do not all necessarily apply even in every instance in which the reliability of scientific testimony is challenged. It might not be surprising in a particular case, for example, that a claim made by a scientific witness has never been the subject of peer review, for the particular application at issue may never previously have interested any scientist. Nor, on the other hand, does the presence of *Daubert*'s general acceptance factor help show that an expert's testimony is reliable where the discipline itself lacks reliability, as, for example, do theories grounded in any so-called generally accepted principles of astrology or necromancy.

At the same time . . . some of *Daubert*'s questions can help to evaluate the reliability even of experience-based testimony. In certain cases, it will be appropriate for the trial judge to ask, for example, how often an engineering expert's experience-based methodology has produced erroneous results, or whether such a method is generally accepted in the relevant engineering community. Likewise, it will at times be useful to ask even of a witness whose expertise is based purely on experience, say, a perfume tester able to distinguish among 140 odors at a sniff, whether his preparation is of a kind that others in the field would recognize as acceptable.

*Id.* at 151. The Court emphasized that the purpose of *Daubert*'s gatekeeping requirement “is to make certain 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.” *Id.* at 152. It further emphasized the considerable leeway that must be afforded to the trial court in determining whether particular expert testimony is reliable. *Id.* It clarified that when assessing reliability, the trial court must have flexibility in determining whether special briefing or other proceedings are necessary, and that, as it held in *Joiner*, the court’s decision will be reviewed under an abuse of discretion standard. *Id.*

Turning to the case at hand, the Court held that the trial court did not abuse its discretion by excluding the testimony. The district court had found unreliable the methodology employed by the expert in analyzing the data obtained through his inspection of the tire, and the scientific basis, if any, for his analysis. The Court noted that, among other things, the trial court could reasonably have wondered whether the expert’s method of visual and tactile inspection was sufficiently precise, and these concerns might have been amplified by Carlson’s repeated reliance on the subjectiveness of his analysis and the fact that he had inspected the tire for the first time the morning of his deposition, and only for a few hours, having based his initial conclusions on photographs. *Id.* at 155. Additionally, the trial court found that none of the *Daubert* factors, including that of general acceptance, indicated that Carlson’s testimony was reliable. *Id.* at 156. With respect to Carlson’s claim that his method was accurate, the court noted that, as stated in *Joiner*, “nothing . . . requires a district court to admit opinion evidence that it is connected to existing data only by the ipse dixit of the expert.” *Id.* at 157. For these and other reasons, the Court concluded that the trial court did not abuse its discretion by excluding the expert testimony. *Id.* at 158.

Stated broadly, these three cases hold that when assessing *any* type of expert testimony under Rule 702, the *Daubert* standard applies; the inquiry is a flexible one; and the trial court will be reversed only for an abuse of discretion.

2. **Effective Date of Amendments to Rule 702(a).** As noted above, the 2011 amendments to Rule 702(a) incorporate the *Daubert* standard. The amendments to section 702(a) apply to “actions commenced” on or after October 1, 2011. See S.L. 2011-283, secs. 1.3, 4.2. “[T]he trigger date” for applying the amended version of the rule is the date that the bill of indictment is filed. *State v. Walston*, 229 N.C. App. 141, 152 (2013), *rev’d on other grounds*, 367 N.C. 721 (2014); *State v. McLaughlin*, \_\_\_ N.C. App. \_\_\_, 786 S.E.2d 269, 286 (2016); *State v. Gamez*, 228 N.C. App. 329, 332-33 (2013). If a second indictment is filed on or after October 1, 2011 and is joined for trial with an indictment filed before the statute’s effective date, the proceeding is deemed to have commenced on the date the first indictment was filed. *Gamez*, 228 N.C. App. at 333. However, in a case involving one indictment in which a superseding indictment is filed, the date of the superseding indictment controls. *Walston*, 229 N.C. App. at 152.
3. **Effect of Pre-Amendment Case Law.** The North Carolina Supreme Court has stated that the 2011 amendments did not abrogate all North Carolina precedents interpreting that rule. Specifically, it has stated: “Our previous cases are still good law if they do not conflict with the *Daubert* standard.” *State v. McGrady*, 368 N.C. 880,

at 888 (2016). It is not entirely clear what that statement means. The 2011 amendments adopting the *Daubert* standard changed only the reliability prong of the Rule 702 analysis; the relevancy and qualifications prongs were not changed. Thus, this Chapter assumes that this statement means: (1) that cases applying the relevancy and qualifications prongs of the analysis remain good law; and (2) that cases applying the more lenient pre-*Daubert* standard to the reliability prong are inconsistent with the analysis under the new *Daubert* rule. However, cases applying the pre-*Daubert* standard to the reliability prong to hold that evidence is inadmissible are likely to be consistent with a result that obtains from application of the *Daubert* standard (after all, evidence that could not pass muster under the earlier standard is unlikely to do so under the new stricter standard). By contrast, cases applying the more lenient pre-*Daubert* standard to the reliability prong to hold that evidence is admissible may not be consistent with a result that obtains under the stricter *Daubert* test, and perhaps should be viewed with some skepticism.

## B. Relevancy.

1. **Generally.** Rule 702 requires that the testimony “will assist the trier of fact to understand the evidence or to determine a fact in issue.” This prong of the analysis is referred to as the “relevancy test.” *Daubert*, 509 U.S. at 591 (“This condition goes primarily to relevance. Expert testimony which does not relate to any issue in the case is not relevant and, ergo, non-helpful.” (quotation omitted)); see also *McGrady*, 368 N.C. at 889. As with any evidence, the expert testimony must meet the minimum standard for logical relevance under Rule 401. *McGrady*, 368 N.C. at 889. “In other words, the testimony must ‘relate to [an] issue in the case.’” *Id.* (quoting *Daubert*); see also *State v. Oakes*, 209 N.C. App. 18, 28-29 (2011) (the defendant was not prejudiced by the trial court’s decision to exclude testimony by the defendant’s use of force expert on the issue of the defendant’s intent to kill where intent to kill was irrelevant to the charge of felony-murder); see generally [Relevancy](#) in this Benchbook (discussing relevancy under Rule 401).
2. **“Assist the Trier of Fact.”** As used in this prong of the inquiry, the term relevance means something more than standard relevancy under Rule 401. *McGrady*, 368 N.C. at 889. As the North Carolina Supreme Court has explained, “In order to ‘assist the trier of fact,’ expert testimony must provide insight beyond the conclusions that jurors can readily draw from their ordinary experience.” *Id.* (going on to note: “An area of inquiry need not be completely incomprehensible to lay jurors without expert assistance before expert testimony becomes admissible. To be helpful, though, that testimony must do more than invite the jury to substitute the expert’s judgment of the meaning of the facts of the case for its own” (citation and quotation omitted)). Thus, in *McGrady*, the court held that the trial court did not abuse its discretion by excluding a defense expert proffered to testify to “pre-attack cues” and “use of force variables” to support the defense of self-defense and defense of others. 368 N.C. at 894-95. According to the expert, pre-attack cues are actions “exhibited by an aggressor as a possible precursor to an actual attack” including “actions consistent with an assault, actions consistent with retrieving a

weapon, threats, display of a weapon, employment of a weapon, profanity and innumerable others.” *Id.* at 894. He said that “use of force variables” refer to circumstances and events that influence a person's decision about the type and degree of force necessary to repel a perceived threat, such as the age, gender, size, and number of individuals involved; the number and type of weapons present; and environmental factors. *Id.* at 895. The court held that the trial court did not abuse its discretion by concluding that the expert’s testimony about pre-attack cues and use of force variables would not assist the jury because these matters were within the jurors' common knowledge. The court noted: the factors the expert “cited and relied on to conclude that defendant reasonably responded to an imminent, deadly threat are the same kinds of things that lay jurors would be aware of, and would naturally consider, as they drew their own conclusions.” *Id.*

3. **“Fit” Test.** Another aspect of relevancy is the “fit” of the expert testimony to the facts of the case. *Daubert*, 509 U.S. at 591-92. As referred to in this way, the fit test ensures that proffered “expert testimony . . . is sufficiently tied to the facts of the case that it will aid the jury in resolving a factual dispute.” *State v. Babich*, \_\_\_ N.C. App. \_\_\_, 797 S.E.2d. 359, 362 (2017) (quoting *Daubert*). Thus for example, the North Carolina Court of Appeals held that expert testimony on retrograde extrapolation that assumed, with no evidence, that the defendant was in a post-absorptive state failed the fit test and was inadmissible. *Id.* Issues of “fit” overlap with the third-prong of the reliability analysis, that the witness has applied the principles and methods reliably to the facts of the case, as discussed below in Section II.D.
4. **Illustrative Cases.** Illustrative cases addressing this prong of the test are annotated below. Because this prong of the Rule 702(a) admissibility inquiry was not altered by the 2011 amendments to the rule, the cases listed below include those decided both before and after the 2011 amendments.

*State v. McGrady*, 368 N.C. 880, 894–95 (2016). In this murder case, the trial court did not abuse its discretion by excluding a defense expert proffered to testify to “pre-attack cues” and “use of force variables” to support the defense of self-defense and defense of others. The expert’s report stated that pre-attack cues are actions “exhibited by an aggressor as a possible precursor to an actual attack” including “actions consistent with an assault, actions consistent with retrieving a weapon, threats, display of a weapon, employment of a weapon, profanity and innumerable others.” He indicated that “use of force variables” refer to additional circumstances and events that influence a person's decision about the type and degree of force necessary to repel a perceived threat, such as age, gender, size, and number of individuals involved; the number and type of weapons present; and environmental factors. The trial court did not abuse its discretion by concluding that the expert’s testimony about pre-attack cues and use of force variables would not assist the jury because these matters were within the jurors' common

knowledge. The court noted: the factors the expert “cited and relied on to conclude that defendant reasonably responded to an imminent, deadly threat are the same kinds of things that lay jurors would be aware of, and would naturally consider, as they drew their own conclusions.” In fact, the expert’s own report stated that, even without formal training, individuals recognize and respond to these cues and variables when assessing a potential threat.

*State v. Babich*, \_\_\_ N.C. App. \_\_\_, 797 S.E.2d. 359, 361-64 (2017). Holding that an expert’s retrograde extrapolation testimony that assumed, with no evidence, that the defendant was in a post-absorptive state failed the “fit” test and was inadmissible. The court held:

[W]hen an expert witness offers a retrograde extrapolation opinion based on an assumption that the defendant is in a post-absorptive or post-peak state, that assumption must be based on at least some underlying facts to support that assumption. This might come from the defendant’s own statements during the initial stop, from the arresting officer’s observations, from other witnesses, or from circumstantial evidence that offers a plausible timeline for the defendant’s consumption of alcohol.

When there are at least some facts that can support the expert’s assumption that the defendant is post-peak or post-absorptive, the issue then becomes one of weight and credibility, which is the proper subject for cross-examination or competing expert witness testimony. But where, as here, the expert concedes that her opinion is based entirely on a speculative assumption about the defendant—one not based on any actual facts—that testimony does not satisfy the *Daubert* “fit” test because the expert’s otherwise reliable analysis is not properly tied to the facts of the case.

*State v. Daughtridge*, \_\_\_ N.C. App. \_\_\_, 789 S.E.2d 667, 675-76 (2016). The trial court improperly allowed a medical examiner to testify, as an expert in forensic pathology, that the victim’s death was a homicide when that opinion was based not on medical evidence but rather on non-medical information provided to the expert by law enforcement officers involved in the investigation of the victim’s death. The State failed to adequately explain how the medical examiner was in a better position than the jurors to evaluate whether the information provided by the officers was more suggestive of a homicide than a suicide.

*State v. Martin*, 222 N.C. App. 213, 216–18 (2012). The trial court did not abuse its discretion by excluding testimony by a defense

proffered “forensic scientist and criminal profiler.” During voir dire the witness identified what he considered to be inconsistencies in the victim’s version of events leading up to and during the alleged sexual assaults and evidence consistent with what he described as “investigative red flags.” The witness’s testimony, which would have discredited the victim’s account of the defendant’s action on the night in question and commented on the manner in which the criminal investigation was conducted “appears to invade the province of the jury.”

*State v. Fox*, 58 N.C. App. 231, 233 (1982). The trial court did not err by refusing to allow a psychiatrist testifying as an expert witness to give his opinion that the defendant believed he was acting in self-defense. The court held: “we do not find error in the trial court’s conclusion that it was for the jury to ascertain defendant’s motive for the killing.” The court concluded that the expert

certainly was qualified to give an opinion as to [the defendant’s] mental capacity and any mental disorders he may have identified, and the record shows he was permitted to do so. Indeed, the psychiatrist was permitted to testify that defendant had told him he had acted in the belief that the victim was going to kill him and that he had been frightened. We find nothing in the record to indicate that the witness was better qualified than the jury to judge the defendant’s veracity based on all the evidence.

### C. Qualifications.

1. **Generally.** The second requirement for admissibility of expert testimony is that the witness must be “qualified as an expert by knowledge, skill, experience, training, or education.” N.C. R. EVID. 702(a). “This portion of the rule focuses on the witness’s competence to testify as an expert in the field of his or her proposed testimony.” *McGrady*, 368 N.C. at 889. It asks: “Does the witness have enough expertise to be in a better position than the trier of fact to have an opinion on the subject?” *Id.*

The North Carolina Supreme Court has noted that “[e]xpertise can come from practical experience as much as from academic training” and that:

The rule does not mandate that the witness always have a particular degree or certification, or practice a particular profession. But this does not mean that the trial court cannot screen the evidence based on the expert’s qualifications. In some cases, degrees or certifications may play a role in determining the witness’s qualifications, depending on the content of the witness’s testimony and the field of the witness’s purported expertise.

*Id.* at 889-90. It also has noted that “[d]ifferent fields require different ‘knowledge, skill, experience, training, or education,’” *id.* at 896, explaining:

For example, a witness with a Ph.D. in organic chemistry may be able to describe in detail how flour, eggs, and sugar react on a molecular level when heated to 350 degrees, but would likely be less qualified to testify about the proper way to bake a cake than a career baker with no formal education.

*Id.*

Once a witness is found to be qualified to testify as an expert, issues sometimes arise about whether the expert is being asked to testify outside of his or her area of expertise. For a discussion of that issue, see Section III.E. below.

2. **Illustrative Cases.** Examples of North Carolina cases addressing this prong of the test are provided below. This list is meant to be illustrative, not exhaustive. Because this prong of the Rule 702(a) admissibility inquiry was not altered by the 2011 amendments to the rule, the cases below include those decided both before and after the 2011 amendments to the Rule.

*State v. McGrady*, 368 N.C. 880, 895–96 (2016). In this murder case, the trial court did not abuse its discretion by concluding that a defense expert, Mr. Cloutier, was not qualified to offer expert testimony on the stress responses of the sympathetic nervous system. Cloutier’s report stated that an instinctive survival response to fear “can activate the body’s sympathetic nervous system” and the “‘fight or flight’ response.” He indicated that the defendant’s perception of an impending attack would cause an adrenaline surge “activat[ing] instinctive, powerful and uncontrollable survival responses.” He maintained that this nervous system response causes “perceptual narrowing,” focusing a person’s attention on the threat and leading to a loss of peripheral vision and other changes in visual perception. According to Cloutier, this nervous system response also can cause “fragmented memory,” or an inability to recall events. The expert, a former police officer, testified that he was not a medical doctor but had studied “the basics” of the brain in general college psychology courses. He also testified that he had read articles and been trained by medical doctors on how adrenaline affects the body, had personally experienced perceptual narrowing, and had trained numerous police officers and civilians on how to deal with these stress responses. Noting that Rule 702(a) “does not create an across-the-board requirement for academic training or credentials,” the court held that it was not an abuse of discretion to require a witness who intended to testify about the

functions of an organ system to have some formal medical training.

*State v. Morgan*, 359 N.C. 131, 159–61 (2004). The trial court did not abuse its discretion by holding that the State's witness was qualified to testify as an expert in the field of bloodstain pattern interpretation where the witness completed two training sessions on bloodstain pattern interpretation, had analyzed bloodstain patterns in dozens of cases, had previously testified in a homicide case as a bloodstain pattern interpretation expert, and described in detail to the judge and jury the difference between blood spatter and transfer stains and produced visual aids to illustrate his testimony. The witness's "qualifications are not diminished, as defendant suggests, by the fact that he has never written an article, lectured, or taken a college-level course on bloodstain or blood spatter analysis."

*State v. Cooper*, 229 N.C. App. 442, 461-63 (2013). In this murder case where files recovered from the defendant's computer linked the defendant to the crime, the trial court abused its discretion by concluding that a defense expert proffered to testify that the defendant's computer had been tampered with was not qualified to give expert testimony. The witness had worked for many years in the computer field, specializing in computer network security. However, the witness had no training and experience as a forensic computer analyst. The trial court erred by concluding that because the digital data in question was recovered using forensic tools and methods, only an expert forensic computer analyst was qualified to interpret and form opinions based on the data recovered. It concluded: "Nothing in evidence supports a finding that [the expert] was not qualified to testify using the data recovered by the State. [The expert], based upon expertise acquired through practical experience, was certainly better qualified than the jury to form an opinion as to the subject matter to which his testimony applie[d]." (quotation and citation omitted).

*State v. Dew*, 225 N.C. App. 750, 760-61 (2013). In this child sex case, the trial court did not err by qualifying as an expert a family therapist who provided counseling to the victims. Among other things, the witness had a master's degree in Christian counseling and completed additional professional training relating to the trauma experienced by children who have been sexually abused; she engaged in private practice as a therapist and was a licensed family therapist and professional counselor; and over half of her clients had been subjected to some sort of trauma, with a significant number having suffered sexual abuse.

*State v. Britt*, 217 N.C. App. 309, 314-15 (2011). SBI agents were properly qualified to give expert testimony regarding firearm tool mark identification.

*State v. Norman*, 213 N.C. App. 114, 122-24 (2011). The trial court did not abuse its discretion by qualifying the State's witness, Mr. Glover, as an expert in the fields of forensic blood alcohol physiology and pharmacology, breath and blood alcohol testing, and the effects of drugs on human performance and behavior. Glover was the head of NC Department of Health and Human Services Forensic Test for Alcohol branch. He oversaw training of officers on the operation of alcohol breath test instruments and of drug recognition experts, who observed the effects of drugs in individuals. Glover had a bachelor of science and a master's degree in biology and was certified as a chemical analyst on breath test instruments used in North Carolina. He attended courses at Indiana University regarding the effects of alcohol on the human body, the various methods for determining alcohol concentrations, and on the effects of drugs on human psychomotor performance. Glover published several works and previously had been qualified as an expert in forensic blood alcohol physiology and pharmacology, breath and blood alcohol testing, and the effects of drugs on human performance and behavior over 230 times in North Carolina. The court concluded that despite Glover's lack of a formal degree or certification in the fields of physiology and pharmacology, his extensive practical experience qualified him to testify as an expert. *See also State v. Green*, 209 N.C. App. 669, 672-75 (2011) (holding that the trial court did not abuse its discretion by finding that Glover was qualified to testify as an expert in the areas of pharmacology and physiology).

*State v. Norton*, 213 N.C. App. 75, 80-81 (2011). The trial court did not abuse its discretion by finding that a forensic toxicologist was qualified to testify about the effects of cocaine on the body. The court concluded: "As a trained expert in forensic toxicology with degrees in biology and chemistry, the witness . . . was plainly in a better position to have an opinion on the physiological effects of cocaine than the jury."

*State v. Hargrave*, 198 N.C. App. 579, 584-85 (2009). The court rejected the defendant's argument that the trial court erred by admitting testimony from the State lab technician (who testified that the substances found by law enforcement contained cocaine) because the expert did not have an advanced degree. The witness had a Bachelor's degree in chemistry, completed basic law

enforcement training and in-house training to be a forensic drug chemist and testified as an expert in that field on approximately forty previous occasions.

**D. Reliability.**

1. **Generally.** The third requirement of Rule 702(a) is the three-pronged reliability test that is new to the amended rule:

- (1) the testimony must be based upon sufficient facts or data;
- (2) the testimony must be the product of reliable principles and methods; and
- (3) the witness must have applied the principles and methods reliably to the facts of the case.

N.C. R. EVID. 702(a). These three prongs together constitute the reliability inquiry discussed in the *Daubert* line of cases, *McGrady*, 368 N.C. at 890, discussed in Section II.A.1. above. Citing extensively from those cases, the North Carolina Supreme Court has noted that:

- Although the primary focus of this inquiry is the reliability of the witness's principles and methodology, not the conclusions that they generate, conclusions and methodology are not entirely distinct. Thus, when a trial court concludes that there is simply too great an analytical gap between the data and the opinion proffered, "the court is not required to admit opinion evidence that is connected to existing data only by the *ipse dixit* of the expert." *McGrady*, 368 N.C. at 890 (quotations and citations omitted).
- "The precise nature of the reliability inquiry will vary from case to case depending on the nature of the proposed testimony" and the trial court has discretion in determining how to address the reliability analysis. *Id.*
- The five factors identified in *Daubert* (whether the theory or technique can and has been tested; whether it has been subjected to peer review and publication; the theory or technique's known or potential rate of error; whether there are standards controlling its operation; and whether the theory or technique enjoys general acceptance within the relevant scientific community) bear on the reliability of the evidence, but the trial court should use whatever factors it thinks most appropriate for the inquiry. *Id.*
- Other factors considered by courts in the reliability inquiry include whether:
  - (1) the expert is testifying based on research conducted independent of the litigation;
  - (2) the expert has unjustifiably extrapolated from an accepted premise to an unfounded conclusion;
  - (3) the expert has adequately accounted for obvious alternative explanations;

- (4) the expert has employed the same care in reaching litigation-related opinions as the expert employs in performing the expert's regular professional work; and
- (5) the field of expertise claimed by the expert is known to reach reliable results for the type of opinion the expert would give.

*McGrady*, 368 N.C. at 891.

- The inquiry remains a flexible one; neither *Daubert's* five factors nor this additional list of factors constitute a checklist; the trial court is free to consider other factors, depending on the type of testimony at issue. *Id.* at 891-92.

Cases decided since *McGrady* have reiterated these points. See, e.g., *State v. Hunt*, \_\_\_ N.C. App. \_\_\_, 790 S.E.2d 874, 881 (2016); *State v. Turbyfill*, \_\_\_ N.C. App. \_\_\_, 776 S.E.2d 249, 258 (2015).

Note that the third-part of the reliability analysis—that the witness has applied the principles and methods reliably to the facts of the case—overlaps, in some respect, with issues of “fit” with respect to the relevancy prong of the analysis, discussed above in Section II.B.3.

**2. Illustrative Cases.** Examples of North Carolina cases applying *Daubert* to this prong of the analysis include:

*State v. McGrady*, 368 N.C. 880, 897–99 (2016). In this murder case, the trial court did not abuse its discretion by concluding that a defense expert's testimony regarding reaction times was unreliable. The testimony was offered to rebut any assumption in the jurors' minds that the defendant could not have acted defensively if he shot the victim in the back. Because the expert testified on voir dire that he interviewed the defendant and other witnesses; reviewed interviews of the defendant and a witness, the case file, and physical evidence collected by the Sherriff's Department; and visited the crime scene, the expert's testimony satisfied the “sufficient facts or data” requirement in Rule 702(a)(1). However, the expert based his testimony about average reaction times on statistics from two studies, but did not know whether or not those studies reported error rates and, if so, what those error rates were. Thus, a trial judge could reasonably conclude that the expert's degree of unfamiliarity with the studies rendered unreliable his testimony about them and the conclusions about the case that he drew from them. Also, while the expert established that a disability could affect reaction time, he failed to account for the defendant's back injury in his analysis. This failure relates both to the sufficiency of the facts and data relied upon and to whether the expert applied his own methodology reliably in this case.

*State v. Hunt*, 790 N.C. App. 874, 877, 880-81 (2016). In this drug case, the trial court properly allowed the State's witness, a special

agent and forensic chemist with the State Crime Lab, to testify as an expert in forensic chemistry. The expert testified that following Crime Lab administrative procedure, he applied a testing procedure called the “administrative sample selection” to the pharmaceutically manufactured pills in question. This involves visually inspecting the shape, color, texture, and manufacturer's markings or imprints of all units and comparing them to an online database to determine whether the pills are pharmaceutically prepared. After the chemist determines that the units are similar and not counterfeit, the protocol requires the chemist to weigh the samples, randomly select one, and chemically analyze that tablet, using gas chromatography and a mass spectrometer. The expert testified that upon receiving the pills, he divided them into four categories based on their physical characteristics. Using administrative sample selection, he tested one pill from the first three groups. Each tested positive for oxycodone. The combined weight of the pills in these categories exceeded the trafficking amount. Upon inspecting the pills that he did not chemically analyze according to their physical characteristics, he found them consistent with a pharmaceutical preparation containing oxycodone. The court held that, based on the expert's detailed explanation of his use of lab procedures, his testimony was the “product of reliable principles and methods.” The court rejected the defendant's argument that the expert's testimony regarding the pills that were not chemically analyzed was not “based upon sufficient facts or data” and did not reflect application of “the principles and methods reliably to the facts of the case.” Specifically, the defendant pointed to lab rules and regulations stating that under administrative sampling selection, no inferences about unanalyzed materials are to be made. The expert testified however that the lab rules and regulations regarding no inferences for unanalyzed substances does not apply to pharmaceutically prepared substances. For other cases involving sampling in drug testing, see Section II.F.14. below.

*State v. Abrams*, \_\_\_ N.C. App. \_\_\_, 789 S.E.2d 863, 864-65 (2016). In this drug case, the trial court did not abuse its discretion by admitting expert testimony identifying the substance at issue as marijuana. At trial, Agent Baxter, a forensic scientist with the State Crime Lab, testified that she examined the substance, conducted relevant tests, and found that the substance was marijuana. The court rejected the defendant's argument that the expert's testimony was not “the product of reliable principles and methods” and that the evidence failed to show that she applied the principles and methods reliably to the facts of the case. Baxter's testimony established that she analyzed the substance in accordance with State Lab procedures, providing detailed testimony regarding each step in her process. Specifically, identifying the substance as marijuana involves the following steps: separating weighable materials from packaging; recording the weight; conducting a preliminary analysis, such as a color test;

conducting a microscopic examination, looking for identified characteristics of marijuana (e.g., unique characteristics of the leaves); and conducting the Duquenois–Levine color test. The court concluded: “Based on her detailed explanation of the systematic procedure she employed to identify the substance . . . , a procedure adopted by the NC Lab specifically to analyze and identify marijuana, her testimony was clearly the ‘product of reliable principles and methods’ sufficient to satisfy . . . Rule 702(a).” The court went on to reject the defendant’s argument that Baxter’s testimony did not establish that she applied the principles and methods reliably to the facts of the case. Based on Baxter’s testimony regarding her handling of the sample at issue, the court held that Baxter’s testimony established that the principles and methods were applied reliably the substance at issue.

#### E. Procedural Issues.

1. **Preliminary Question of Fact.** The admissibility of expert testimony is determined by the trial court pursuant to Rule 104(a). *McGrady*, 368 N.C. at 892. *See generally* N.C. R. EVID. 104(a). In determining admissibility, the trial judge is not bound by the rules of evidence, except those with respect to privileges. *McGrady*, 368 N.C. at 892 (quoting N.C. R. EVID. 104(a)).  
To the extent that factual findings are necessary to determine admissibility, the trial judge acts as the trier of fact. *Id.* at 892 (citing Commentary to N.C. R. EVID. 104(a)). The standard for factual findings is the greater weight of the evidence *Id.* at 892–93.
2. **Burden of Proof.** The proponent of the evidence bears the burden of establishing that the evidence is admissible. *State v. Ward*, 364 N.C. 133, 140 (2010) (pre-amendment expert witness case).
3. **Flexible Inquiry.** Because Rule 702(a) does not mandate any particular procedure for the court to determine the admissibility of expert testimony, the trial court has the discretion to determine how to best handle the matter. *Kumho Tire*, 526 U.S. at 152 (“The trial court must have the same kind of latitude in deciding *how* to test an expert's reliability, and to decide whether or when special briefing or other proceedings are needed to investigate reliability, as it enjoys when it decides *whether or not* that expert's relevant testimony is reliable.”); *see also McGrady*, 368 N.C. at 892; *State v. Walston*, \_\_\_ N.C. \_\_\_, 798 S.E.2d 741, 747 (2017) (citing *McGrady* and noting that “Rule 702 does not mandate any particular procedural requirements for evaluating expert testimony”); *State v. Abrams*, \_\_\_ N.C. App. \_\_\_, 789 S.E.2d 863, 866 (2016) (quoting *McGrady*). In simple cases, an appropriate foundation may be laid on direct examination. *McGrady*, 368 N.C. at 893. In more complex cases, the trial court may opt for special briefings, submission of affidavits, voir dire testimony, or an *in limine* hearing. *Id.* Whatever the case, the trial court “should use a procedure that, given the circumstances of the case, will secure fairness in administration, elimination of unjustifiable expense and delay, and promotion of growth and development of the law of evidence to the end that the truth may be ascertained and proceedings justly determined.” *Id.* (quotation omitted).

Noting the difficulty a silent record creates for purposes of appeal, a concurring opinion in one post-*McGrady* cases suggests:

[B]est practice dictates parties should challenge an expert's admissibility through a motion *in limine*. In the event a trial court delays its ruling on the matter, or in the event a party fails to raise the challenge until the expert is called upon at trial, our trial courts should afford parties a *voir dire* hearing to examine the witness and submit evidence into the record, which this Court can review on appeal.

4. **Findings of Fact & Conclusion of Law.** In *McGrady*, the North Carolina Supreme Court stated that the trial court must find the relevant facts pertaining to admissibility and then, based on these findings, determine whether the proffered expert testimony meets the rule's requirements of qualification, relevance, and reliability. *McGrady*, 368 N.C. at 892–93. Although some language in at least one subsequent court of appeals case suggests that the trial courts are not required to make findings of fact or conclusions of law regarding the admissibility of expert testimony, *Abrams*, \_\_\_ N.C. App. at \_\_\_, 789 S.E.2d at 868 (Hunter, J., concurring) (“At the present, trial courts are not required to make findings of fact or conclusions of law when they accept or reject an expert witness.”), that same case suggests that the better practice in light of *McGrady* is to make such findings and conclusions on the record. *Id.* at 869 (“[T]he trial court should identify the *Daubert* factors and make findings of fact and conclusions of law, either orally or in writing, as to the expert's admissibility.”).
5. **Informing the Jury of Witness's Expert Status.** Some commentators and authority from other jurisdictions suggest that it is preferable for the trial court not to advise the jury that it has found a witness to be an expert, to avoid undue influence that the jury might place on the witness's testimony. See e.g., Advisory Committee Notes to FED. R. EVID. 702 (“[T]here is much to be said for a practice that prohibits the use of the term ‘expert’ by both the parties and the court at trial. Such a practice ensures that trial courts do not inadvertently put their stamp of authority on a witness's opinion, and protects against the jury's being overwhelmed by the so-called ‘experts.’” (quotation omitted)); National Commission on Forensic Science, Views of the Commission Regarding Judicial Vouching (June 21, 2016) (“The Commission is of the view that it is improper and misleading for a trial judge to declare a witness to be an expert in the presence of the jury.”), <https://www.justice.gov/ncfs/file/880246/download>; *United States v. Johnson*, 488 F.3d 690, 697-98 (6th Cir. 2007) (agreeing with decisions that have articulated “good reasons” for not informing the jury that a witness has been qualified as an expert); Michael H. Graham, *Expert Witness Testimony: Fed. R. Evid. 702-705 Primer; Hypothetical Question Discretionary Use*, 52 No. 5 CRIM. L. BULL. Art. 8 (2016) (“It is preferable that the court not advise the jury of its determination if it decides that the witness is in fact qualified as an expert as to a particular subject matter.”). However, several older North Carolina criminal cases

found no error when a trial court determined that a witness was an expert in the presence of the jury. *State v. Frazier*, 280 N.C. 181, 197, *vacated on other grounds*, 409 U.S. 1004 (1972) (the trial court determined, in the presence of the jury, that two witnesses were qualified to testify as experts; stating: “It has never been the general practice in the courts of this State for the trial judge to excuse the jury from the courtroom when ruling upon the qualification of a witness to testify as an expert.”); *State v. Edwards*, 24 N.C. App. 303, 305 (1974) (citing *Frazier* and holding that the trial court did not err by stating, in the presence of the jury, that it found a medical doctor to be expert witness). Additionally, N.C. Pattern Instruction – Crim 104.94 (Testimony of Expert Witness) expressly informs the jury of the witness’s status as an expert and at least one unpublished case indicates that the better practice is to give this instruction. *State v. Dunn*, 220 N.C. App. 524, \*9 (2012) (unpublished) (holding that no error occurred when the trial court failed to give the pattern instruction but noting: “the better practice is for the trial court to specifically instruct the jury on expert testimony when an expert has testified at trial”); see *generally* *State v. Prevatte*, 356 N.C. 178, 224 (2002) (noting that the court has approved of the pattern instruction).

- F. Particular Types of Experts.** Several common types of expertise are explored in the sections immediately below. This Chapter does not attempt to present an exhaustive evaluation of these areas of expert testimony. Rather, it provides the trial judge with an overview of the current state of North Carolina law with respect to each category and alerts the trial court to potential issues. As science and technology evolve, new tests and analyses may be developed providing a better understanding as to the strengths and weakness of tests and analyses currently being done and resulting in new tests and analyses. Either or both developments may impact existing law.

When discussing certain forensic science disciplines, this Chapter cites the following report: PRESIDENT’S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY, *FORENSIC SCIENCE IN CRIMINAL COURTS: ENSURING SCIENTIFIC VALIDITY OF FEATURE-COMPARISON METHODS* (2016) [hereinafter PCAST REPORT], [https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast\\_forensic\\_science\\_report\\_final.pdf](https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf). This report is cited because it is the most recent comprehensive evaluation of the relevant forensic science disciplines. Although some, such as the National Association of Criminal Defense Lawyers, have applauded that report, it was not adopted by the Department of Justice and others, including the National District Attorneys Association, have been critical of it or have challenged it. Jack D. Rody, *The PCAST Report: A Review and Moving Forward—A Prosecutor’s Perspective*, CRIMINAL JUSTICE, Summer 2017, at 9 (discussing the reaction to the report by prosecutors, defense attorneys, and the forensic science community).

For discussion of the proper scope of expert testimony in sexual assault cases, see [Evidence Issues Criminal Cases Involving Child Victims and Child Witnesses](#) in this Benchbook.

- 1. Use of Force & Self-Defense Experts.** Although use of force and self-defense experts are used in North Carolina criminal trials, see, e.g., *State v. McDowell*, 215 N.C. App. 184, 189 (2011) (noting that Mr. Cloutier testified as an expert in “use-of-force science” and self-defense tactics),

few published cases directly address the admissibility of such evidence. One case that does is *State v. McGrady*, 368 N.C. 880 (2016), decided under amended Rule 702(a) and the *Daubert* standard. In *McGrady*, the North Carolina Supreme Court held that the trial court did not abuse its discretion by excluding testimony by a defense proffered expert. At trial the defendant sought to call Dave Cloutier as an expert in “the science of the use of force” *Id.* at 883. Cloutier was proffered to testify on three topics:

- (1) that, based on the “pre-attack cues” and “use of force variables” present in the interaction between defendant and the victim, the defendant's use of force was a reasonable response to an imminent, deadly assault that the defendant perceived;
- (2) that defendant's actions and testimony are consistent with those of someone experiencing the sympathetic nervous system's “fight or flight” response; and
- (3) that reaction times can explain why some of defendant's defensive shots hit the victim in the back.

*Id.* at 894. The Supreme Court held that the trial court did not abuse its discretion in excluding the expert's testimony about “pre-attack cues” and “use of force variables” on grounds that it was not relevant. *Id.* Cloutier's report indicated that pre-attack cues are actions “exhibited by an aggressor as a possible precursor to an actual attack,” and include “actions consistent with an assault, actions consistent with retrieving a weapon, threats, display of a weapon, employment of a weapon, profanity and innumerable others.” *Id.* According to Cloutier, “use of force variables” include additional circumstances and events that influence a person's decision about the type and degree of force necessary to repel a threat, such as age, gender, size, and number of individuals involved; the number and type of weapons present; and environmental factors. *Id.* at 895. The court found this testimony would not assist the jury because these matters were within the juror's common knowledge. *Id.*

Next, the *McGrady* court found that the trial court did not abuse its discretion by concluding that Cloutier was not qualified to offer expert testimony on the stress responses of the sympathetic nervous system. *Id.* Cloutier's report stated that an instinctive survival response to fear “can activate the body's sympathetic nervous system” and the “‘fight or flight’ response.” *Id.* He indicated that the defendant's perception of an impending attack would cause an adrenalin surge “activat[ing] instinctive, powerful and uncontrollable survival responses.” *Id.* He further maintained that this nervous system response causes “perceptual narrowing,” focusing a person's attention on the threat and leading to a loss of peripheral vision and other changes in visual perception. *Id.* According to Cloutier, this nervous system response also can cause “fragmented memory,” or an inability to recall specific events related to the threatening encounter. *Id.* at 895-96. The court held that it was not an abuse of discretion to require “a witness who intended to testify about the functions of an organ system to have some formal medical training.” *Id.* at 896.

Finally, the court held that the trial court did not abuse its discretion by finding that the expert's testimony regarding reaction times

was unreliable. *Id.* at 897. This testimony was offered to rebut any assumption in the jurors' minds that the defendant could not have acted defensively if he shot the victim in the back. *Id.* Because the expert testified on voir dire that he interviewed the defendant and other witnesses; reviewed interviews of the defendant and a witness, the case file, and physical evidence collected by the Sheriff's Department; and visited the location of the incident, the expert's testimony satisfied the "sufficient facts or data" requirement in Rule 702(a)(1). *Id.* However, the expert based his testimony about average reaction times on statistics from two studies, but did not know whether or not those studies reported error rates and, if so, what those error rates were. Thus, a trial judge could reasonably conclude that the expert's degree of unfamiliarity with the studies rendered unreliable his testimony about them and the conclusions about the case that he drew from them. *Id.* at 898-99. Also, while the expert established that a disability could affect reaction time, he failed to account for the defendant's back injury in his analysis. The court found that this failure relates both to the sufficiency of the facts and data relied upon and to whether the expert applied his own methodology reliably in this case. *Id.* at 899.

2. **DNA Identification Evidence.** "Deoxyribonucleic acid, or DNA, is a molecule that encodes the genetic information in all living organisms." FEDERAL JUDICIAL CENTER & NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES, REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 131 (3d ed. 2011) [hereinafter REFERENCE MANUAL ON SCIENTIFIC EVIDENCE], <https://www.fjc.gov/sites/default/files/2015/SciMan3D01.pdf>. "DNA analysis involves comparing DNA profiles from different samples to see if a known sample may have been the source of an evidentiary sample." PCAST REPORT at 69. It is important to understand, however, that the term "DNA testing" encompasses different kinds of testing methods, different sources of bodily material, and differing statistical means of assessing the significance of a match, all of which has changed and likely will continue to change as science and technology advance. 4 DAVID L. FAIGMAN ET AL., MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY 157 (2016-17 ed.) [hereinafter MODERN SCIENTIFIC EVIDENCE]. Although some forms of DNA evidence are now admissible in all jurisdictions, there are many types of forensic DNA analysis, and more are being developed. REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 131. Questions of admissibility will continue to arise as advancing methods of analysis and novel applications of established methods are introduced. *Id.*

This Chapter does not attempt to explain the wide variety of DNA testing that has been and currently is being done in forensic labs and potential issues regarding that testing. For a discussion of the history of DNA evidence, the types of scientific expertise that go into the analysis of DNA samples, the scientific principles behind DNA typing, issues regarding sample quantity and quality and laboratory performance, issues in the interpretation of laboratory results, special issues in human DNA testing for identification, and forensic analysis of nonhuman DNA, see REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 131-210. For the PCAST REPORT's assessment of DNA testing using single source samples,

simple mixture samples, and complex mixture samples, see PCAST REPORT at 69-83.

Although expert testimony regarding DNA analysis repeatedly has been found to be admissible in North Carolina prior to the 2011 amendments to Rule 702, *see, e.g.*, *State v. Pennington*, 327 N.C. 89, 98-101 (1990), there do not appear to be any published North Carolina cases directly assessing any form of DNA testing under the new *Daubert* standard. Courts in other jurisdictions have allowed expert testimony regarding the polymerase chain reaction and short tandem repeats method of DNA typing under the *Daubert* standard. *See generally* 33A FED. PROC., L. ED. § 80:226 (“Applying the *Daubert* test, expert DNA evidence has generally been found to be admissible. More specifically, based on overwhelming scientific and forensic acceptance, as well as acceptance by the vast majority of courts, the polymerase chain reaction and short tandem repeats (PCR/STR) method of DNA typing has been held reliable and admissible under the rule governing expert opinion and *Daubert*.”).

Separate from *Daubert* standard issues, expert testimony that amounts to a “prosecutor’s fallacy” is improper. “The prosecutor’s fallacy is the assumption that the random match probability is the same as the probability that the defendant was not the source of the DNA sample.” *McDaniel v. Brown*, 558 U.S. 120, 128 (2010). The U.S. Supreme Court has explained:

In other words, if a juror is told the probability a member of the general population would share the same DNA is 1 in 10,000 (random match probability), and he takes that to mean there is only a 1 in 10,000 chance that someone other than the defendant is the source of the DNA found at the crime scene (source probability), then he has succumbed to the prosecutor’s fallacy. It is . . . error to equate source probability with probability of guilt, unless there is no explanation other than guilt for a person to be the source of crime-scene DNA. This faulty reasoning may result in an erroneous statement that, based on a random match probability of 1 in 10,000, there is a .01% chance the defendant is innocent or a 99.99% chance the defendant is guilty.

*Id.*; *see also* *State v. Ragland*, 226 N.C. App. 547, 558-60 (2013) (the State’s expert improperly relied on the prosecutor’s fallacy, erroneously assuming that the random match probability was the same as the probability that the defendant was not the source of the DNA sample; this testimony was inadmissible).

- 3. Bite Mark Identification Evidence.** Bite mark analysis “typically involves examining marks left on a victim or an object . . . and comparing those marks with dental impressions taken from a suspect.” PCAST REPORT at 83. For a discussion of the technique involved with this type of analysis, see REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 103-08.

North Carolina cases decided prior to the 2011 amendment to Rule 702 have held that the trial court did not abuse its discretion by

admitting expert bite mark identification testimony. See, e.g., *State v. Temple*, 302 N.C. 1, 10-13 (1981) (deciding an issue of first impression, the court held that the trial court properly admitted expert testimony that bite marks appearing on the victim's body were made by the defendant's teeth); *State v. Green*, 305 N.C. 463, 470-72 (1982) (citing *Temple*, the court held that the trial court properly allowed an expert to testify that a bite mark on the victim's arm had been made by the defendant). However, there do not appear to be any published North Carolina cases analyzing bite mark identification analysis under the new *Daubert* standard. Research revealed only one North Carolina bite mark case decided under amended Rule 702(a), but that case did not deal with bite mark *identification* evidence. See *State v. Ford*, \_\_\_ N.C. App. \_\_\_, 782 S.E.2d 98, 107-08 (2016) (trial court did not commit plain error by allowing the State's forensic pathology expert to opine that victim's death was due to bites from a dog).

Although questions have been raised about the validity of bite mark analysis, see, e.g., PCAST REPORT at 83-87 (“[B]itemark analysis does not meet the scientific standards for foundational validity, and is far from meeting such standards. To the contrary, available scientific evidence strongly suggests that examiners cannot consistently agree on whether an injury is a human bitemark and cannot identify the source of bite mark with reasonable accuracy.”), courts in other jurisdictions have continued to admit the evidence. REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 112.

- 4. Fingerprint Identification Evidence.** Fingerprint identification evidence refers to the use of fingerprints as a means of personal identification, e.g., that fingerprints found at the murder scene match fingerprints on file for the defendant. For a discussion of the methodology used in fingerprint identification analysis, see REFERENCE MANUAL OF SCIENTIFIC EVIDENCE at 73-76, and PCAST REPORT at 88-91.

Expert testimony regarding fingerprint analysis has been admissible in North Carolina for many years under the state's pre-*Daubert* standards. *State v. Irick*, 291 N.C. 480, 488-89 (1977); see also *State v. Hoff*, 224 N.C. App. 155, 163 (2012) (citing *Irick* and noting “our Supreme Court's long-standing acceptance of the reliability of fingerprint evidence”); *State v. Parks*, 147 N.C. App. 485, 490-91 (2001) (no abuse of discretion in admitting officer's expert testimony in fingerprint analysis given that the state Supreme Court has “recognized that fingerprinting is an established and scientifically reliable method of identification”). There do not appear to be any published North Carolina criminal cases evaluating fingerprint analysis under the *Daubert* standard. Courts in other jurisdictions have—for the most part—held such testimony to be sufficiently reliable expertise under *Daubert*. See REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 82-83. The Fourth Circuit is among the courts to have found fingerprint evidence sufficiently reliable under *Daubert*. *United States v. Crisp*, 324 F.3d 261, 266-69 (4th Cir. 2003) (citing other circuit courts that have held similarly).

For a discussion of the empirical record regarding this type of identification, see REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 76-81, and PCAST REPORT at 91-100. For an assessment as to the foundational validity and validity as applied of fingerprint evidence, see PCAST

REPORT at 101-103 (finding that “latent fingerprint analysis is a foundationally valid subjective methodology” and that “[c]onclusions of a proposed identification may be scientifically valid, provided that they are accompanied by accurate information about limitations on the reliability of the conclusion”; going on to identify a number of issues regarding validity as applied).

5. **Firearm Identification.** In firearms identification analysis, sometimes called “ballistics,” “examiners attempt to determine whether ammunition is or is not associated with a specific firearm based on marks produced by guns on the ammunition.” PCAST REPORT at 104. For a discussion of the methodology of this this analysis, see REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 91-97, and PCAST REPORT at 104.

Pre-*Daubert* North Carolina cases had allowed this type of expert testimony. See, e.g., *State v. Britt*, 217 N.C. App. 309, 314 (2011) (“Courts in North Carolina have upheld the admission of expert testimony on firearm toolmark identification for decades.”). There do not appear to be any published North Carolina cases applying the new *Daubert* standard to this type of evidence.

Although testimony by firearms experts is widely admitted nationwide with little judicial scrutiny, provided the expert is qualified, 3 BARBARA E. BERGMAN ET AL., *WHARTON'S CRIMINAL EVIDENCE* § 13:59 (15th ed.) [hereinafter *WHARTON'S CRIMINAL EVIDENCE*] (but noting: “Little justification appears to warrant such a cavalier attitude toward this testimony.”), some post-*Daubert* decisions have excluded or limited expert firearms analysis testimony. See REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 101-02 (discussing cases). Questions have been raised about the foundational validity of firearms analysis. See PCAST REPORT at 112 (“PCAST finds that firearms analysis currently falls short of the criteria for foundational validity, because there is only a single appropriately designed study to measure validity and estimate reliability. The scientific criteria for foundational validity require more than one such study, to demonstrate reproducibility.”); REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 97-100 (discussing the empirical record on this type of evidence and noting, in part: “The issue of the adequacy of the empirical basis of firearms identification expertise remains in dispute . . . .”). Additionally, it has been suggested that if firearms analysis is allowed in court, validity as applied requires that the expert has undergone rigorous proficiency testing and that certain disclosures be made. PCAST REPORT at 113.

6. **Blood Alcohol Extrapolation.** “Retrograde extrapolation is a mathematical analysis in which a known blood alcohol test result is used to determine what an individual’s blood alcohol level would have been at a specified earlier time.” *State v. Cook*, 362 N.C. 285, 288 (2008). The analysis determines the prior blood alcohol level based on (1) the time elapsed between the earlier event, such as a vehicle crash, and the blood test, and (2) the rate of elimination of alcohol from the subject’s blood during the time between the event and the test. *Id.*

North Carolina cases decided under both *Howerton* and *Daubert* have held that the trial court does not abuse its discretion by admitting expert testimony regarding blood alcohol extrapolation. See, e.g., *State v. Turbyfill*, \_\_\_ N.C. App. \_\_\_, 776 S.E.2d 249, 255-58 (2015) (applying

*Daubert* and holding that testimony by the State's expert "confirmed that blood alcohol extrapolation is a scientifically valid field, which principles have been tested, subjected to peer review and publication, and undisputedly accepted in the scientific community and in our courts"); *State v. Green*, 209 N.C. App. 669, 677-680 (2011) (same, under earlier *Howerton* standard).

However, for expert testimony on retrograde extrapolation to be admissible it must be based on sufficiently reliable data and a reliable method of proof. Faulty assumptions in the expert's application of retrograde extrapolation analysis can render the expert testimony inadmissible. *Compare State v. Babich*, \_\_\_ N.C. App. \_\_\_, 797 S.E.2d 359, 361-364 (2017) (the trial court erred by admitting retrograde extrapolation expert testimony where the expert assumed that the defendant was in a post-absorptive state at the time of the stop (meaning that alcohol was no longer entering the defendant's bloodstream and thus her blood alcohol level was declining) but there were no facts to support this assumption; reasoning that such testimony was inadmissible "as a matter of law" because it failed *Daubert's* "fit" test in that the expert's analysis was not properly tied to the facts of the case; going on to hold: "[W]hen an expert witness offers a retrograde extrapolation opinion based on an assumption that the defendant is in a post-absorptive . . . state, that assumption must be based on at least some underlying facts to support that assumption. This might come from the defendant's own statements during the initial stop, from the arresting officer's observations, from other witnesses, or from circumstantial evidence that offers a plausible timeline for the defendant's consumption of alcohol."), and *State v. Davis*, 208 N.C. App. 26, 31-35 (2010) (holding, under the earlier and more lenient *Howerton* standard that the trial court committed reversible error by allowing expert Paul Glover to testify to the defendant's blood-alcohol level based on retrograde extrapolation where the alcohol concentration upon which Glover based the extrapolation was estimated to be .02 based on the fact that an officer smelled alcohol on the defendant's breath more than ten hours after the incident; Glover's "odor analysis" was not a sufficiently reliable method of proof), with *State v. Green*, 209 N.C. App. 669, 677-80 (2011) (holding, under the earlier and more lenient *Howerton* standard that the trial court did not abuse its discretion by allowing expert Paul Glover to testify regarding retrograde extrapolation notwithstanding the defendant's argument that Glover's testimony was based on impermissible factual assumptions regarding the amount of wine in the defendant's glass and when it was consumed).

7. **Blood Spatter Analysis.** Blood spatter analysis, sometimes called blood spatter interpretation or bloodstain analysis, is a forensic tool in which stains of blood at a crime scene are examined to provide information about the incident, such as where the victim was killed. For the purposes of this discussion, blood spatter analysis includes the process of examining blood that has struck a surface, and applying knowledge regarding the characteristics of blood and the shapes or patterns made by its impact, in order to determine things like the direction, angle, and speed of its flight prior to impact, and, ultimately, to assist in reconstructing events occurring in connection with an alleged crime. *See generally* Danny R. Veilleux, *Admissibility, in Criminal Prosecution, of Expert*

*Opinion Evidence as to "Blood Spatter" Interpretation*, 9 A.L.R.5th 369 (originally published 1993) (discussing the admissibility of evidence so described). For more information about the history of bloodstain analysis and the biology, physics and mathematics associated with it, see Aaron D. Gopen & Edward J. Imwinkelried, *Bloodstain Pattern Analysis Revisited*, 45 No. 3 CRIM. L. BULL. ART. 7 (2009) [hereinafter *Bloodstain Pattern Analysis Revisited*].

In cases decided under the old *Howerton* standard, North Carolina courts have found bloodstain analysis to be a sufficiently reliable area for expert testimony. See, e.g., *State v. Goode*, 341 N.C. 513, 530-31 (1995) (rejecting the defendant's argument that bloodstain pattern interpretation has not been established as a scientifically reliable field; also rejecting the defendant's argument that Agent Duane Deaver did not have sufficient qualifications to testify as an expert in the field); see also *State v. Morgan*, 359 N.C. 131, 160 (2004) (citing *Goode* for that proposition, although it was not an issue in that case); *State v. Bruton*, 165 N.C. App. 801, 809 (2004) (citing *Goode* and holding that the trial court did not err by allowing an expert in forensic serology to testify regarding the nature of blood spatter over the defendant's challenge to her qualifications as an expert).

There do not appear to be any North Carolina cases addressing the admissibility of this evidence under the *Daubert* standard. For a discussion of how this evidence is handled in other jurisdictions, see 9 A.L.R.5th 369 and *Bloodstain Pattern Analysis Revisited*, *supra* p. 28.

8. **Fiber Analysis.** In criminal cases, expert testimony may be offered to show that certain fibers do or do not "match", typically in the context of proving or disproving that the suspect had contact with a particular person or place. This section refers to this sort of testimony as fiber analysis.

In pre-*Daubert* North Carolina cases, fiber analysis testimony has been found to be admissible. See, e.g., *State v. Vestal*, 278 N.C. 561, 593-94 (1971) (no error to allow an expert in the field of analyzing and comparing fibers to testify "concerning the similarity of the drapes found in the defendant's warehouse with that found upon the body"). There do not appear to be any North Carolina cases analyzing this evidence under the *Daubert* standard. Some have raised questions about whether fiber analysis satisfies the *Daubert* standard. See, e.g., 4 MODERN SCIENTIFIC EVIDENCE at 114 ("The validity of fiber identification techniques is susceptible of objective testing, although this has not been accomplished on a scale and in such a manner as to satisfy *Daubert*. The error rate of fiber examination is unknown. The validity of the interpretation of the significance of a match in fiber evidence has not been subjected to systematic testing of the sort countenanced by *Daubert*.").

9. **Hair Analysis.** "Forensic hair examination is a process by which examiners compare microscopic features of hair to determine whether a particular person may be the source of a questioned hair." PCAST REPORT at 118. For a discussion of the technique used in this type of analysis, see REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 113-14.

Several North Carolina cases decided prior to the 2011 amendment to Rule 702 approved of admitting expert testimony regarding hair analysis. See, e.g., *State v. Green*, 305 N.C. 463, 470 (1982) ("This Court has previously approved of testimony similar to that employed in the case before us and we are not inclined to reverse that holding.")

(citation omitted)); *State v. Vestal*, 278 N.C. 561, 593–94 (1971) (no error to allow an expert in the field of analyzing and comparing hair to testify regarding the similarity of hairs found in a warehouse and trunk of the defendant's automobile with hairs taken from the head of the victim's body); *State v. McCord*, 140 N.C. App. 634, 659 (2000) (the trial court did not abuse its discretion by admitting expert testimony that a pubic hair taken from the victim was microscopically consistent with a known sample of defendant's pubic hair; "because the comparison of hair samples has been accepted as reliable scientific methodology in this State, the trial court properly allowed [the analyst] to testify regarding the results of his testing"); *State v. Suddreth*, 105 N.C. App. 122, 132 (1992) ("Our courts have liberally permitted the introduction of expert testimony as to hair analysis when relevant to aid in establishing the identity of the perpetrator.").

However, case law suggests that hair analysis is conclusive, if at all, only as to negative identify—that is, to exclude a suspect. *State v. Stallings*, 77 N.C. App. 189, 191 (1985). For example, if the hair in question is blonde, straight, and 12 inches long, an individual with black, curly, two inch long hair can be excluded as the source of the sample. 4 MODERN SCIENTIFIC EVIDENCE at 111. Cases also hold that microscopic hair analysis evidence is insufficient on its own to positively identify a defendant as the perpetrator. *Stallings*, 77 N.C. App. at 191 (hair analysis "must be combined with other substantial evidence to take a case to the jury"); *State v. Bridges*, 107 N.C. App. 668, 671 (1992) (citing *Stallings* and stating that it "may not be used to positively identify a defendant as the perpetrator of a crime"), *aff'd per curiam*, 333 N.C. 572 (1993); *State v. Faircloth*, 99 N.C. App. 685, 692 (1990) (same). As the court stated in *Stallings*: "Unlike fingerprint evidence . . . comparative microscopy of hair is not accepted as reliable for positively identifying individuals. Rather, it serves to exclude classes of individuals from consideration and is conclusive, if at all, only to negative identity." *Stallings*, 77 N.C. App. at 191.

Additionally, some pre-*Daubert* cases limit the scope of a hair analysis expert's testimony. See *Bridges*, 107 N.C. App. at 671-75 (the trial court erred by admitting the expert's testimony about the statistical probability of two Caucasians having indistinguishable head hair because there was insufficient foundation for this testimony); *Faircloth*, 99 N.C. App. at 690-92 (the trial court erred by allowing a hair examination and identification expert to testify that it was "improbable" that pubic hairs obtained from the victim's body and from a sheet on the victim's bed came from an individual other than the defendant and that it would be "impossible" for another person whose hair was consistent with the defendant's to have come in contact with the victim's bedsheets).

There do not appear to be any North Carolina cases ruling on the admissibility of this evidence under the *Daubert* standard. It should be noted that in recent years, serious questions have been raised about the validity of forensic hair analysis and associated expert testimony. See, e.g., Spencer S. Hsu, *FBI Admits Flaws in Hair Analysis Over Decades*, THE WASHINGTON POST, April 18, 2015 (reporting that "[t]he Justice Department and FBI have formally acknowledged that nearly every examiner in an elite FBI forensic unit gave flawed testimony in almost all

trials in which they offered evidence against criminal defendants over more than a two-decade period before 2000"); 4 MODERN SCIENTIFIC EVIDENCE at 112 ("The validity of hair evidence is susceptible of objective testing, although this has not been accomplished on a scale and in such a manner as to satisfy *Daubert*. The error rate of hair examination is unknown."); PCAST REPORT 118-122 (finding that materials provided by the Department of Justice "do not provide a scientific basis for concluding that microscopic hair examination is a valid and reliable process"). Although many cases have continued to admit hair analysis post-*Daubert*, that is not universally true and "growing judicial support" for the view that this type of analysis is unreliable has been noted. REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 119.

10. **Shoe Print Analysis.** "Footwear analysis is a process that typically involves comparing a known object, such as a shoe, to a complete or partial impression found at a crime scene, to assess whether the object is likely to be the source of the impression." PCAST REPORT at 114.

Although some North Carolina cases state that a non-expert may testify to shoe print comparisons, see, e.g., *State v. General*, 91 N.C. App. 375, 379 (1988) (citing *State v. Jackson*, 302 N.C. 101, 107 (1981)); *State v. Plowden*, 65 N.C. App. 408, 410 (1983) (same), trial courts have admitted expert testimony on this topic. See, e.g., *State v. Williams*, 308 N.C. 47, 60–61 (1983) (noting that an SBI Agent was accepted as an expert witness and testified extensively concerning the unique characteristics of the tread on the shoes taken from the defendant and the shoe prints found at the scene of the crime). However, there do not appear to be any North Carolina cases examining the admissibility of this evidence under the *Daubert* standard. Although federal courts have admitted expert shoe print testimony under *Daubert*, see, e.g., *United States v. Ford*, 481 F.3d 215, 217-21 (3d Cir. 2007); *United States v. Allen*, 390 F.3d 944, 949-50 (7th Cir. 2004); *United States v. Mahone*, 328 F. Supp. 2d 77, 90-92 (D. Me. 2004), *aff'd*, 453 F.3d 68 (1st Cir. 2006), questions have been raised about the foundational validity of this analysis. See PCAST REPORT at 117 (concluding that "there are no appropriate empirical studies to support the foundational validity of footwear analysis to associate shoeprints with particular shoes based on specific identifying marks (sometimes called [r]andomly acquired characteristics). Such conclusions are unsupported by any meaningful evidence or estimates of their accuracy and thus are not scientifically valid.").

11. **Handwriting Analysis.** Handwriting analysis seeks to determine the authorship of a piece of writing by examining the way in which the letters are inscribed, shaped and joined and comparing it to samples by a known author. 4 MODERN SCIENTIFIC EVIDENCE at 561-62. For a discussion of the technique used in this type of analysis and the empirical record regarding its validity, see REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 83-89.

North Carolina civil cases decided before the amendment to Rule 702(a) upheld admission of expert testimony regarding handwriting analysis, see, e.g., *Taylor v. Abernethy*, 149 N.C. App. 263, 270-74 (2002) (trial court erred by refusing to allow a handwriting expert to give his opinion regarding the validity of a signature on a contract). There do not appear to be any published North Carolina cases on point after North

Carolina became a *Daubert* state. In other jurisdictions, there is a three-way split of authority regarding this type of expert testimony:

The majority of courts permit examiners to express individuation opinions. As one court noted, “all six circuits that have addressed the admissibility of handwriting expert [testimony] . . . [have] determined that it can satisfy the reliability threshold” for nonscientific expertise. In contrast, several courts have excluded expert testimony, although one involved handprinting and another Japanese handprinting. Many district courts have endorsed a third view. These courts limit the reach of the examiner’s opinion, permitting expert testimony about similarities and dissimilarities between exemplars but not an ultimate conclusion that the defendant was the author (“common authorship” opinion) of the questioned document. The expert is allowed to testify about “the specific similarities and idiosyncrasies between the known writings and the questioned writings, as well as testimony regarding, for example, how frequently or infrequently in his experience, [the expert] has seen a particular idiosyncrasy.” As the justification for this limitation, these courts often state that the examiners’ claimed ability to individuate lacks “empirical support.”

REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 90. The Fourth Circuit is among the courts that have held that expert handwriting testimony passes muster under *Daubert*. See *United States v. Crisp*, 324 F.3d 261, 270-71 & n.5 (4th Cir. 2003) (deciding the issue as a matter of first impression; citing circuit court decisions that have held similarly but noting that some district courts recently had held that handwriting analysis does not meet the *Daubert* standard).

12. **Horizontal Gaze Nystagmus (HGN).** A leading treatise explains horizontal gaze nystagmus as follows:

Nystagmus is an involuntary rapid movement of the eyeball, which may be horizontal, vertical or rotary. An inability of the eyes to maintain visual fixation as they are turned from side to side (in other words, jerking or bouncing) is known as horizontal gaze nystagmus, or HGN. Proponents of HGN tests believe that alcohol and drug use increases the frequency and amplitude of HGN and cause it to occur at a smaller angle of deviation from forward. Nystagmus tests are not done in a laboratory, but rather are given by police officers in the field or in a police station subsequent to arrest. The results of an HGN test are frequently introduced as part of the state’s case in drunk driving prosecutions and they also may be used when an individual is suspected to be under the influence of some other substance . . . .

5 MODERN SCIENTIFIC EVIDENCE at 459 (quotation omitted).

Rule 702(a1) provides that a witness qualified under Rule 702(a) “and with proper foundation, may give expert testimony solely on the issue of impairment and not on the issue of specific alcohol concentration level relating to . . . [t]he results of a [HGN] Test when the test is administered by a person who has successfully completed training in HGN.” This subsection obviates the State’s need to prove that the horizontal gaze nystagmus testing method is sufficiently reliable. *State v. Younts*, \_\_\_ N.C. App. \_\_\_, \_\_\_ S.E.2d \_\_\_ (July 18, 2017) (post-amendment case); *State v. Smart*, 195 N.C. App. 752, 755-56 (2009) (pre-amendment case); see also *State v. Godwin*, \_\_\_ N.C. \_\_\_, 800 S.E.2d 47 (2017) (“Furthermore, with the 2006 amendment to Rule 702, our General Assembly clearly signaled that the results of the HGN test are sufficiently reliable to be admitted into the courts of this State.”). Whether there are due process limits on the legislature’s ability to declare certain expert testimony to be reliable is beyond the scope of this Chapter.

According to the text of the Rule 702(a1) HGN expert testimony is admissible when the witness is qualified under Rule 702(a) and a proper foundation is laid. N.C. R. EVID. 702(a1); see also *State v. Torrence*, \_\_\_ N.C. App. \_\_\_, 786 S.E.2d 40, 42 (2016) (“[I]f an officer is going to testify on the issue of impairment relating to the results of an HGN test, the officer must be qualified as an expert witness under Rule 702(a) and establish proper foundation.”). Although the better practice may be to do so, the court is not required to expressly determine that the witness is so qualified; such a determination can be implied from the record. *Godwin*, \_\_\_ N.C. \_\_\_, 800 S.E.2d 47, 52-53 (2017) (holding that the trial court implicitly found that the witness was qualified to testify but noting that “the appellate division’s ability to review the trial court’s oral order would have benefited from the inclusion of additional facts supporting its determination that [the] Officer . . . was qualified to testify as an expert regarding his observations of defendant’s performance during the HGN test”). Presumably a proper foundation would include establishing that the test was performed according to accepted protocol.

Once the witness is qualified and a proper foundation is laid, the witness may give expert testimony regarding the HGN test results, subject to the additional limitations in subsection (a1), namely, the witness may testify solely on the issue of impairment and not on the issue of specific alcohol concentration. N.C. R. EVID. 702(a1); see also *Torrence*, \_\_\_ N.C. App. \_\_\_, 786 S.E.2d at 43 (prejudicial error where officer testified to a specific alcohol concentration); see also *State v. Turbyfill*, \_\_\_ N.C. App. \_\_\_, 776 S.E.2d 249, 259 (2015) (officer’s testimony as to the defendant’s BAC appears to have violated Rule 702(a1)) but the error did not have a probable impact on the verdict).

13. **Eyewitness Identification Experts.** Several North Carolina appellate decisions have found no abuse of discretion where the trial court excluded testimony regarding reliability of eyewitness identification evidence when the expert’s testimony did not relate to the facts of the particular case, see, e.g., *State v. McLean*, 183 N.C. App. 429, 435 (2007) (expert did not interview the witnesses, visit the crime scene, or listen to court testimony), or because its prejudicial value outweighed its

probative value under Rule 403, see, e.g., *McLean*, 183 N.C. App. at 435 (no abuse of discretion where the trial court found that the value of the evidence was “marginally weak” and that it would confuse the jury, unnecessarily delay the proceeding, and would not significantly help the jury); *State v. Cotton*, 99 N.C. App. 615, 621-22 (1990), *aff'd*, 329 N.C. 764 (1991) (similar). However, a recent decision of the North Carolina Supreme Court suggests that it is not proper to exclude such testimony simply because the expert has not interviewed or examined the witness. *State v. Walston*, \_\_\_ N.C. \_\_\_, 798 S.E.2d 741, 747 (2017) (holding that the trial court did not abuse its discretion by excluding testimony from a defense expert regarding repressed memory and the suggestibility of memory; the court clarified that to be admissible, the expert need not have examined or interviewed the witness, noting: “[s]uch a requirement would create a troubling predicament given that defendants do not have the ability to compel the State’s witnesses to be evaluated by defense experts”).

The United States Supreme Court has noted that “some States . . . permit defendants to present expert testimony on the hazards of eyewitness identification evidence.” *Perry v. New Hampshire*, 565 U.S. 228, 247 (2012) (quoting *State v. Clopton*, 223 P.3d 1103, 1113 (“We expect . . . that in cases involving eyewitness identification of strangers or near-strangers, trial courts will routinely admit expert testimony [on the dangers of such evidence].”). Commentators have noted that while eyewitness testimony identifying the perpetrator of the crime is often important evidence for the State in a criminal trial, such testimony has been found to be erroneous in some cases. 2 MODERN SCIENTIFIC EVIDENCE at 578 (noting that in cases where DNA evidence exonerated defendants, eyewitness evidence identified the defendant as the perpetrator). They argue that expert testimony may help explain why such testimony can be wrong, by, for example, describing the impact of “estimator variables” (factors that might affect the eyewitnesses ability to perceive the events accurately, e.g., lighting conditions, or to describe accurately what was perceived) and “system variables” (factors outside the control of the eyewitness, such as the suggestiveness of a photo array). *Id.*

#### 14. Drug Identification & Quantity.

- a. **Chemical Analysis Generally Required.** In *State v. Ward*, 364 N.C. 133 (2010), a case decided under the more lenient *Howerton* standard, the North Carolina Supreme Court held that “[u]nless the State establishes . . . that another method of identification is sufficient to establish the identity of the controlled substance beyond a reasonable doubt, some form of scientifically valid chemical analysis is required” to identify a substance as a controlled substance. *Id.* at 147.

At least one post-*Ward* North Carolina case applying the *Daubert* standard has found no error when an expert testified to drug identification based on a chemical analysis. See, e.g., *State v. Abrams*, \_\_\_ N.C. App. \_\_\_, 789 S.E.2d 863, 865-67 (2016) (expert testified that the substance was marijuana based on a chemical analysis; the expert’s testimony was “clearly” the product of reliable principles and methods and her testimony established

that she applied those principles and methods reliability to the facts of the case).

- b. **Visual Identification.** In *Ward*, the North Carolina Supreme Court held that the visual inspection methodology proffered by the State's expert was not sufficiently reliable to identify the pills at issue as containing a controlled substance. *Ward*, 364 N.C. at 142-48 (method of proof was not sufficiently reliable); see also *State v. Brunson*, 204 N.C. App. 357, 359-61 (2010) (holding, in a pre-*Ward* case, that it was plain error to allow an expert to opine that the substance at issue was hydrocodone, an opium derivative, based on visual identification and Micromedex Literature). It is unlikely that the court's reasoning would lead it to a different result under the more stringent *Daubert* standard. And in fact, one court of appeals case has applied that rule to a case in which the amended rule applied. *State v. Alston*, \_\_\_ N.C. App. \_\_\_, \_\_\_ S.E.2d \_\_\_ (June 20, 2017) (even if officer had been an expert it would have been error to allow him to testify that pills found at the defendant's home were Oxycodone and Alprazolam, where the basis of his identification was a visual inspection and comparison of the pills with a website).

In cases decided after *Ward*, the Court of Appeals has held that visual identification cannot be used to identify a substance as cocaine, *State v. Jones*, 216 N.C. App. 519, 526 (2011), or pills as a controlled substance. *State v. Alston*, \_\_\_ N.C. App. \_\_\_, \_\_\_ S.E.2d \_\_\_ (June 20, 2017). However, it has allowed visual identification to identify a substance as marijuana. *State v. Johnson*, 225 N.C. App. 440, 455 (2013) (holding that the State was not required to test the substance alleged to be marijuana where the arresting officer testified without objection that based on his training the substance was marijuana); *State v. Mitchell*, 224 N.C. App. 171, 178-79 (2012) (an officer properly was allowed to identify the substance at issue as marijuana based on his "visual and olfactory assessment"; a chemical analysis of the marijuana was not required); *Jones*, 216 N.C. App. at 526 (visual identification of marijuana was permissible); *State v. Garnett*, 209 N.C. App. 537, 546 (2011) (Special Agent, who was an expert in forensic chemistry, properly made an in-court visual identification of marijuana).

It is difficult to reconcile the Court of Appeals' post-*Ward* decisions on visual identification with respect to substances that are not controlled substances. Compare *State v. Hanif*, 228 N.C. App. 207, 209-13 (2013) (applying *Ward* in a counterfeit controlled substance case where the defendant was charged with representing tramadol hydrochloride, a substance that is not a controlled substance, as Vicodin, a Schedule III controlled substance; holding that the trial court committed plain error by admitting evidence identifying the substance as tramadol hydrochloride based solely upon an expert's visual inspection (a comparison of the tablets' markings to a Micromedex online database)), with *State v. Hooks*, \_\_\_ N.C. App. \_\_\_, 777 S.E.2d 133, 140-41 (2015) (in a case involving charges of possession of

the precursor chemical pseudoephedrine with intent to manufacture methamphetamine, the court rejected the defendant's argument that the evidence was insufficient because the substance was not chemically identified as pseudoephedrine; holding that *Ward* was limited to identifying controlled substances, and pseudoephedrine is not listed as such a substance).

- c. **Narcotics indicator field test kits (NIKs) & "NarTest" Machines.** In several cases decided under the more lenient *Howerton* standard, the North Carolina Court of Appeals held that the State failed to establish the reliability of certain narcotics indicator field tests. *State v. Meadows*, 201 N.C. App. 707, 708-12 (2010) (the trial court committed prejudicial error by admitting expert testimony on the identity of a controlled substance based on the results of a NarTest machine where the State failed to demonstrate the machine's reliability); *State v. Jones*, 216 N.C. App. 519, 523-25 (2011) (following *Meadows* and holding that the trial court erred by allowing a police captain to testify that the results from a NarTest machine analysis showed that the substance at issue was a controlled substance; also holding that the trial court erred by admitting testimony by the State's expert in forensic chemistry, a NarTest employee, regarding the reliability of the NarTest machine where the machine had not been licensed or certified by any state agency or department, the expert had not done any independent research on the machine outside of his duties as a company employee, the State presented no evidence that the machine had been recognized as a reliable method of testing by other experts in the field, the State presented no publications or research performed by anyone unassociated with NarTest, and although the State offered a visual aid to support the expert's testimony, that aid was a NarTest promotional video); *State v. Carter*, 237 N.C. App. 274, 281-84 (2014) (following *Meadows* and holding that the State failed to demonstrate the reliability of a NIK—apparently a wipe that turns blue when it comes into contact with cocaine—and that therefore the trial court abused its discretion by admitting an investigator's testimony that the NIK indicated the presence of cocaine). Absent different evidence, it is unlikely that the court's reasoning would lead it to a different result under the stricter *Daubert* standard.
- d. **Other Methods of Drug Identification.** In *Ward*, the Supreme Court held that "[u]nless the State establishes . . . that another method of identification is sufficient to establish the identity of the controlled substance beyond a reasonable doubt, some form of scientifically valid chemical analysis is required" to identify a substance as a controlled substance. *Ward*, 364 N.C. at 147 (emphasis added). This language opens the door, in certain circumstances, to the use of methods of drug identification other than chemical testing.

In *State v. Woodard*, 210 N.C. App. 725 (2011), an opium trafficking case arising from a pharmacy break-in, the court rejected the defendant's argument that the evidence was

insufficient to support the conviction because no chemical analysis was done on the pills at issue. *Id.* at 730-31. In so holding the court approved a method of drug identification other than chemical analysis. Citing *Ward*, the court determined that the State is not required to conduct a chemical analysis on a controlled substance, provided it establishes the identity of the controlled substance beyond a reasonable doubt by another method of identification. Here, the State did that through the drug store's pharmacist manager, Mr. Martin, who testified that 2,691 tablets of hydrocodone acetaminophen, an opium derivative, were stolen from the pharmacy. He testified that he kept "a perpetual inventory" of all drug items. Using that inventory, he could account for the type and quantity of every inventory item throughout the day, every day. Accordingly, he was able to identify which pill bottles were stolen from the pharmacy by examining his inventory against the remaining bottles, because each bottle was labeled with an identifying sticker, date of purchase and a partial pharmacy account number. These stickers helped the pharmacist to determine that 2,691 tablets of hydrocodone acetaminophen were stolen. He further testified, based on his experience and knowledge as a pharmacist, that the weight of the stolen pills was approximately 1,472 grams. The court concluded:

Based on Mr. Martin's thirty-five years of experience dispensing the same drugs that were stolen from the . . . Drugstore, and based on Mr. Martin's unchallenged and uncontroverted testimony regarding his detailed pharmacy inventory tracking process, we are persuaded that Mr. Martin's identification of the stolen drugs as more than 28 grams of opium derivative hydrocodone acetaminophen was sufficient evidence to establish the identity and weight of the stolen drugs and was not analogous to the visual identifications found to be insufficient in *Ward* . . . .

*Id.* at 732.

- e. **Sampling.** The *Ward* court stated that its ruling regarding visual identification did not mean that every single item at issue must be chemically tested. In that case, the State submitted sixteen batches of items consisting of over four hundred tablets to the SBI laboratory for testing. *Ward*, 364 N.C. at 148. The court held:

A chemical analysis of each individual tablet is not necessary. The SBI maintains standard operating procedures for chemically analyzing batches of evidence, and the propriety of those procedures is not at issue here. A chemical analysis is required in this context, but its scope may be dictated by whatever sample is sufficient to make a reliable

determination of the chemical composition of the batch of evidence under consideration.

*Id.* Cases decided since *Ward* finding sampling analysis sufficient include:

*State v. Hunt*, \_\_\_ N.C. App. \_\_\_, 790 S.E.2d 874, 881-83 (2016). Testimony from the State's expert sufficiently established a trafficking amount of opium; following lab protocol, the forensic analyst grouped the pharmaceutically manufactured pills into four categories based on their physical characteristics and then chemically analyzed one pill from three categories and determined that they tested positive for oxycodone; he did not test the pill in the final category because the quantity was already over the trafficking amount; the pills that were not chemically analyzed were visually inspected; the analyst was not required to chemically analyze each tablet and his testimony provided sufficient evidence to establish a trafficking amount.

*State v. Lewis*, \_\_\_ N.C. App. \_\_\_, 779 S.E.2d 147, 148-49 (2015). In this conspiracy to traffic in opiates case, the evidence was sufficient where the State's expert analyzed only one of 20 pills, determined its weight and that it contained oxycodone, an opium derivative, and confirmed that the remaining pills were visually consistent with the one that was tested, in terms of size, shape, form and imprints; a chemical analysis of each individual pill was not necessary.

*State v. James*, 240 N.C. App. 456, 459 (2015). In this opium trafficking case, the evidence was sufficient to establish a trafficking amount where the expert chose at random certain pills for chemical testing and each tested positive for oxycodone; the expert visually inspected the remaining, untested pills and concluded that with regard to color, shape, and imprint, they were "consistent with" the pills that tested positive for oxycodone.

*State v. Dobbs*, 208 N.C. App. 272, 275-76 (2010). The trial court did not err by denying the defendant's motion to dismiss a trafficking charge where the State's expert testified that all eight tablets were similar with respect to color and imprint and that a test on one tablet revealed it to be an opiate derivative.

- f. **Unlicensed & Unaccredited Labs.** In a case decided under the more lenient *Howerton* standard, the North Carolina Court of Appeals held to be inadmissible results from a lab that was neither licensed nor accredited by any agency. *State v. Jones*, 216 N.C.

App. 519, 525-26 (2011) (the trial court improperly admitted evidence that an individual tested the substances at issue at a NarTest company laboratory using SBI protocol and determined that the substances were cocaine and marijuana). By comparison, test results from a NarTest lab showing that a substance was cocaine have been found to be admissible where the lab was not accredited but was licensed by the State of North Carolina and the Drug Enforcement Agency to perform analytical testing of controlled substances. *State v. McDonald*, 216 N.C. App. 161, 163-67 (2011) (note that a NarTest machine was not used in the testing of the substances at issue).

15. **Fire Investigation Experts.** In arson cases, an expert may be offered to opine on, for example, where or how the fire started and whether the fire was intentionally set. WHARTON'S CRIMINAL EVIDENCE § 13:55. At the outset, it should be noted that "fire and explosion investigation consists of a wide array of distinctive methods, techniques, and principles," 5 MODERN SCIENTIFIC EVIDENCE at 74, which must be assessed separately.

There do not appear to be any published North Carolina cases applying the *Daubert* standard to this type of expert testimony. Although one recent Court of Appeals case held that if a proper foundation is laid as to expertise, a fire marshal may offer his expert opinion that a fire was intentionally set, *State v. Jefferies*, \_\_\_ N.C. App. \_\_\_, 776 S.E.2d 872, 875 (2015), that case did not mention *Daubert* and it is not clear that amended Rule 702 applied to that case. Citing case law decided prior to the 2011 amendments to Rule 702, that court reasoned:

Generally, the admission of expert opinion testimony is only allowed where "the opinion expressed is ... based on the special expertise of the expert[.]" *State v. Wilkerson*, 295 N.C. 559, 569, 247 S.E.2d 905, 911 (1978). However, our Supreme Court has held that, with a proper foundation laid as to his expertise, a fire marshal may offer his expert opinion as to whether a fire was intentionally set. *State v. Hales*, 344 N.C. 419, 424-25, 474 S.E.2d 328, 330-31 (1996).

*Id.* The only other published criminal case decided after *Daubert* became the law in North Carolina declined to address the defendant's argument that the trial court erred by failing to evaluate, under *Daubert*, testimony by an investigator with the Fire Prevention Bureau of a city fire department that the fire in question was intentionally set. *State v. Hunt*, \_\_\_ N.C. App. \_\_\_, 792 S.E.2d 552, 560-61 (2016). Instead, that court concluded that even if error occurred, it did not rise to the level of plain error. *Id.*

It has been noted that after *Daubert* and *Kumho Tire*, some courts have examined this type of expert testimony more critically. 5 MODERN SCIENTIFIC EVIDENCE at 75, 78; see also WHARTON'S CRIMINAL EVIDENCE § 13:55 (noting that "[s]ince *Daubert* the qualifications and conclusions of arson investigators have been questioned with increasing frequency" and stating that scholarship has revealed that some investigators fail to base their conclusions adequately upon the scientific method or scientific tests

and has debunked several theories upon which investigators have historically relied; further indicating that inherent problems in the investigatory process have surfaced, and it has become apparent that some fire investigators over-exaggerate arson occurrence as well as the incidence of fire-related injury and death). For a survey of cases dealing with expert opinions in arson cases, see Jay M. Zitter, *Admissibility of Expert and Opinion Evidence as to Cause or Origin of Fire in Criminal Prosecution for Arson or Related Offense—Modern Cases*, 85 A.L.R.5th 187 (originally published 2001).

16. **Accident Reconstruction.** In North Carolina, “[a]ccident reconstruction opinion testimony may only be admitted by experts.” *State v. Maready*, 205 N.C. App. 1, 17 (2010) (error to allow officers’ opinion testimony concerning their purported accident reconstruction conclusions where the officers were not qualified as experts).

Subsection (i) of Rule 702 provides that “[a] witness qualified as an expert in accident reconstruction who has performed a reconstruction of a crash, or has reviewed the report of investigation, with proper foundation may give an opinion as to the speed of a vehicle even if the witness did not observe the vehicle moving.”

There do not appear to be any North Carolina criminal cases evaluating accident reconstruction experts under the *Daubert* standard. However, a number of criminal cases decided prior to the 2011 amendments to Rule 702(a) have admitted such evidence. See, e.g., *State v. Brown*, 182 N.C. App. 115, 120 (2007); *State v. Speight*, 166 N.C. App. 106, 116-17 (2005), *vacated on other grounds*, 548 U.S. 923 (2006); *State v. Holland*, 150 N.C. App. 457, 461-464 (2002); *State v. Purdie*, 93 N.C. App. 269, 274-76 (1989). Additionally, at least one North Carolina civil case has allowed accident reconstruction testimony under the new *Daubert* standard. *Pope v. Bridge Broom, Inc.*, 240 N.C. App. 365, 369-78 (trial court did not abuse its discretion by admitting expert accident reconstruction testimony), *review denied*, \_\_\_ N.C. \_\_\_, 775 S.E.2d 861 (2015). For a general discussion of courts’ treatment of expert accident reconstruction testimony, see 5 MODERN SCIENTIFIC EVIDENCE at 829-59.

17. **Pathologists & Cause of Death.** In cases decided both before and after the amendments to Rule 702(a), North Carolina courts have admitted expert pathologist testimony regarding cause of death. Cases decided under the earlier version of Rule 702(a) include, for example: *State v. Johnson*, 343 N.C. 489, 492 (1996) (the trial court did not err in this murder case by allowing a fellow in the Chief Medical Examiner’s office to testify as an expert in pathology as to cause of death and the possible range from which the shots were fired where the witness was not yet certified and had not completed formal training as a forensic pathologist but had performed a number of autopsies prior to performing the one in question); *State v. Miller*, 302 N.C. 572, 580 (1981) (the trial court did not err by allowing an expert forensic pathologist to testify regarding the size or gauge of the gun used as the murder weapon); *State v. Morgan*, 299 N.C. 191, 206-07 (1980) (rejecting the defendant’s challenge to expert testimony offered by the N.C. Chief Medical Examiner that the cause of death was “a shotgun wound, shotgun blast” and noting: “It has long been the rule in North Carolina that the cause of an individual’s death is the

proper subject of expert testimony.”); *State v. Borders*, 236 N.C. App. 149, 175-76 (2014) (the trial court did not err by allowing the State’s forensic pathologists to testify that the cause of death was asphyxiation, even where no physical evidence supported that conclusion; the experts knew that the victim’s home was broken into, that she had been badly bruised, that she had abrasions on her arm and vagina, that her underwear was torn, and that DNA obtained from a vaginal swab containing sperm matched the defendant’s DNA samples; the experts’ physical examination did not show a cause of death, but both doctors drew upon their experience performing autopsies in stating that suffocation victims often do not show physical signs of asphyxiation and they eliminated all other causes of death before arriving at asphyxiation); *State v. Smith*, 157 N.C. App. 493, 498 (2003) (the trial court did not err by allowing the medical examiner to offer an opinion that the victim was killed when struck by the passenger side of the truck’s door frame); *State v. Evans*, 74 N.C. App. 31, 35 (1985) (in this involuntary manslaughter case, the trial properly allowed a pathologist to testify that the child victim’s injuries were not self-inflicted, that the child would not have died but for them, and that a subdural hematoma was a significant cause of death; he further testified that the hematoma could have been caused by violent shaking, causing tearing of the blood vessels between the dura and the brain, adding that death could result either from swelling of the brain or from rapid trauma to the brain from alteration of the blood supply), *aff’d*, 317 N.C. 326 (1986).

For a case decided under the amended version of Rule 702(a), see *State v. Ford*, \_\_\_ N.C. App. \_\_\_, 782 S.E.2d 98, 107-08 (2016) (in this involuntary manslaughter case, where the defendant’s pit bull attacked and killed the victim, the trial court did not commit plain error by allowing a forensic pathologist to opine that the victim’s cause of death was exsanguination due to dog bites).

For a discussion of expert testimony using the words “homicide” or “homicidal,” see Section III.B. below.

18. **Polygraphs.** In a case decided prior to the amendment to Rule 702(a), the North Carolina Supreme Court held that polygraph evidence is inadmissible at trial because of the inherent unreliability of polygraph tests. *State v. Grier*, 307 N.C. 628, 642–45 (1983) (polygraph evidence is inadmissible, even if the parties stipulate to its admissibility); see also *State v. Ward*, 364 N.C. 133, 146 (2010) (noting this holding). Absent some change in the relevant technology, there is little reason to think that the court would rule otherwise under the stricter *Daubert* standard.
19. **Penile Plethysmography.** Penile plethysmography tests a man’s level of sexual arousal. Michael C. Harlow & Charles L. Scott, *Penile Plethysmography Testing for Convicted Sex Offenders*, 35 J. OF AM. ACADEMY OF PSYCHIATRY & LAW 536 (2007), <http://jaapl.org/content/35/4/536>. It “involves placing a pressure-sensitive device around a man’s penis, presenting him with an array of sexually stimulating images, in determining his level of sexual attraction by measuring minute changes in his erectile responses.” *Id.* at 536 (quotation omitted).

Deciding an issue of first impression in a child sex case decided before the 2011 amendments to Rule 702(a), the North Carolina Court of Appeals held that the trial court did not abuse its discretion by excluding opinion testimony by a defense expert in clinical psychology based on penile plethysmograph testing administered to the defendant. *State v. Spencer*, 119 N.C. App. 662, 664-68 (1995) (the expert would have testified that the defendant had a normal arousal pattern and that there was no evidence of his being sexually aroused by children; the trial court did not abuse its discretion in finding the defendant's plethysmograph testing data insufficiently reliable to provide a basis for the opinion testimony).

Although there do not appear to be any North Carolina cases deciding this issue under the new, stricter *Daubert* test, the Fourth Circuit has held that a trial court did not abuse its discretion by ruling that a penile plethysmograph test did not meet *Daubert's* scientific validity prong. *United States v. Powers*, 59 F.3d 1460, 1471 (4th Cir. 1995) (holding, in a child sex case, that the district court did not err by excluding the testimony of a clinical psychologist who would have testified that the results of a penile plethysmograph test did not indicate that the defendant exhibited pedophilic characteristics).

20. **Experts in Crime & Criminal Practices.** A number of North Carolina appellate cases decided under the pre-amendment version of Rule 702(a) found no error where the trial court allowed a law enforcement officer to testify as an expert regarding criminal practices and activity. For example, in *State v. Jennings*, 209 N.C. App. 329 (2011), a child sexual assault case, the court noted:

[T]his Court has held that law enforcement officers may properly testify as experts about the practices criminals use in concealing their identity or criminal activity. See *State v. Alderson*, 173 N.C. App. 344, 350–51, 618 S.E.2d 844, 848–49 (2005) (holding trial court properly permitted SBI agent to “give her opinion as to why the seizure of defendant's police frequency book was important, testifying that finding a police frequency book and a radio scanner can indicate those acting illegally may have a ‘jumpstart’ if they know which police frequencies to monitor.”); *State v. White*, 154 N.C. App. 598, 604, 572 S.E.2d 825, 830–31 (2002) (“Lieutenant Wood had ‘training, and various courses and experience in working certain cases’ which led him to conclude that ‘there are times that the significance of an object such as a pillow or a cloth being placed over somebody's face can mean in a case that the perpetrator knew the victim and did not want to see their face or have their face appear either before, during, or after the crime.’ Since Lieutenant Wood testified in the form of an opinion based on his expertise, and the testimony was likely to assist the jury making an inference from the circumstances of the crime, the trial court properly admitted the testimony.”).

*Id.* at 337–38. *Jennings* went on to hold that a law enforcement officer qualified as an expert in forensic computer examination properly was allowed to testify that those who have proof of criminal activity on a computer will attempt to hide that evidence and that the defendant would have been unlikely to save an electronic conversation that would have implicated him. That testimony was elicited by the State to explain why, despite the victim's testimony that she and the defendant routinely communicated through instant messaging and their MySpace web page and that the defendant took digital photographs of her vaginal area during sex, no evidence of these communications or photographs were recovered from the defendant's electronic devices.

There do not appear to be any published North Carolina criminal cases analyzing this type of expert testimony under the new *Daubert* standard. A number of federal circuit courts have allowed such testimony under that standard. For example, law enforcement officers have been allowed to testify as experts regarding:

- Drug code words. See, e.g., *United State v. York*, 572 F.3d 415, 422 (7th Cir. 2009) (“[W]e allow officers whose testimony is based on some aspect of that understanding (such as the meaning of drug code words), rather than on first-hand knowledge of the particular investigation in the case, to testify as experts.”); *United States v. Dukagjini*, 326 F.3d 45, 52 (2d Cir. 2003) (“[W]e have consistently upheld the use of expert testimony to explain both the operations of drug dealers and the meaning of coded conversations about drugs. In particular, we have recognized that drug dealers often camouflage their discussions and that expert testimony explaining the meanings of code words may ‘assist the trier of fact to understand the evidence or to determine a fact in issue.’” (citation omitted)).
- The use of firearms in the drug trade and common practices of drug dealers. See, e.g., *United States v. Garza*, 566 F.3d 1194, 1199 (10th Cir. 2009) (“[W]e do not believe that *Daubert* and its progeny . . . provide any ground for us to depart from our pre-*Daubert* precedents recognizing that police officers can acquire specialized knowledge of criminal practices and thus the expertise to opine on such matters as the use of firearms in the drug trade.”); *United States v. Norwood*, 16 F. Supp. 3d 848, 852-54 (E.D. Mich. 2014) (citing cases and holding to be admissible testimony by a DEA agent with fifteen years’ experience regarding drug trafficking and use of firearms in drug trafficking).
- Gang practices. See, e.g., *United States v. Hankey*, 203 F.3d 1160, 1167-70 (9th Cir. 2000) (the trial court did not abuse its discretion in admitting an officer’s expert opinion testimony regarding the co-defendants’ gang affiliations and the consequences an individual would suffer if he were to testify against the defendant; among other things, the expert had been with the police department for twenty-one years, worked undercover “with gang members in the thousands,” received formal training in gang structure and organization, and he

taught classes about gangs; stating: “The *Daubert* factors (peer review, publication, potential error rate, etc.) simply are not applicable to this kind of testimony, whose reliability depends heavily on the knowledge and experience of the expert, rather than the methodology or theory behind it.”).

However, some federal court *Daubert* decisions have excluded such testimony as unreliable, at least in certain circumstances. See, e.g., *Norwood*, 16 F. Supp. 3d at 854-64 (excluding proffered expert testimony concerning gangs where the witness formed his opinions based on his experience in Oklahoma, California, and Connecticut and from a national perspective while in Washington, D.C. but the case in question concerned a gang that operated in Flint, Michigan; the witness never investigated the gang in question or other Michigan gangs; “Simply put, [the witness’s] lack of familiarity with the particular gang or locale at issue in this case makes his opinions unreliable to be placed before the jury.”).

Other courts, while noting that an officer involved in an investigation may testify as both a fact and expert witness, also have noted the “inherent dangers” associated with this type of “dual testimony.” See, e.g., *York*, 572 F.3d at 425; *Dukagjini*, 326 F.3d at 53 (“While expert testimony aimed at revealing the significance of coded communications can aid a jury in evaluating the evidence, particular difficulties, warranting vigilance by the trial court, arise when an expert, who is also the case agent, goes beyond interpreting code words and summarizes his beliefs about the defendant’s conduct based upon his knowledge of the case.”). Those dangers include that the witness’s dual role might confuse the jury, that the jury might be impressed by an expert’s “aura of special reliability” and thus give his or her factual testimony undue weight, or that “the jury may unduly credit the opinion testimony of an investigating officer based on a perception that the expert was privy to facts about the defendant not presented at trial.” *York*, 572 F.3d at 425 (citing cases); see also *Dukagjini*, 326 F.3d at 53 (noting other dangers as well). Precautions that can mitigate these dangers include ensuring that the jury knows when an officer is testifying as an expert versus as a fact witness, through the use of cautionary instructions or witness examination that is structured to make clear when the witness is testifying to facts and when he or she is offering an expert opinion. *York*, 572 F.3d at 425-26 (discussing other precautions and going on to hold that admission of certain “dual testimony” by the officer in question was improper). And courts have noted that the trial court should be careful to ensure that the law enforcement officer expert does not “stray from his proper expert function” of offering opinions based on expertise and opine about matters based on his or her investigation in the case. *Dukagjini*, 326 F.3d at 54-55 (witness improperly acted “as a summary prosecution witness” when, for example, he testified about the meaning of conversations in general, as opposed to interpretation of drug code words).

Some commentators have been critical of decisions that reflexively allow police officers to testify as expert on criminal practices. See 1 MODERN SCIENTIFIC EVIDENCE at 101, 104 (although not advocating for a wholesale exclusion of such testimony, stating: “Somewhat disappointing has been the courts’ willingness to admit prosecution

experts who have little research or data to support their opinions. While there is some evidence that this is changing in some areas, such as the forensic sciences, courts continue to permit many prosecution experts with hardly a glance at the methods underlying their testimony. Perhaps the best example is the testimony of police officers testifying as expert witnesses.”).

**III. Form & Scope of Expert’s Opinion.** For a discussion of the proper scope of an expert’s opinion in sexual assault cases, see [Evidence Issues in Criminal Cases Involving Child Victims and Child Witnesses](#), in this Benchbook, and more current cases annotated in [Smith’s Criminal Case Compendium](#) (under Evidence; Opinions; Experts; Sexual Assault Cases).

**A. Form of Testimony.** Rule 702(a) allows for flexibility as to the form of the expert’s testimony, providing that the expert may testify to “an opinion, or otherwise.” Rule 705 provides that “[t]here shall be no requirement that expert testimony be in response to a hypothetical question.” See, e.g., *State v. Fearing*, 304 N.C. 499, 503-04 (1981) (no requirement that testimony of a forensic pathologist be given only in response to a hypothetical question); *State v. Morgan*, 299 N.C. 191, 205 (1980) (“It is settled law in North Carolina that an expert witness need not be interrogated by means of a hypothetical question . . .”).

**B. Opinion on Ultimate Issue & Legal Standards.** Although an expert may not testify to an opinion as to the defendant’s guilt or innocence, see, e.g., *State v. Heath*, 316 N.C. 337, 341-42 (1986), Evidence Rule 704 provides that “[t]estimony in the form of an opinion or inference is not objectionable because it embraces an ultimate issue to be decided by the trier of fact.” See also *State v. Hill*, 116 N.C. App. 573, 581 (1994) (noting this rule and rejecting the defendant’s argument that testimony by the State’s DNA expert regarding a DNA match improperly stated an opinion that the defendant had committed the rape in question).

The North Carolina Supreme Court has explained, however:

In interpreting Rule 704, this Court draws a distinction between testimony about legal standards or conclusions and factual premises. An expert may not testify regarding whether a legal standard or conclusion has been met at least where the standard is a legal term of art which carries a specific legal meaning not readily apparent to the witness. Testimony about a legal conclusion based on certain facts is improper, while opinion testimony regarding underlying factual premises is allowable.

*State v. Parker*, 354 N.C. 268, 289-90 (2001) (internal citations and quotation marks omitted). Applying this rule, cases have held that it is not error to allow:

- a pathologist to testify that a killing was a “homicide” or “homicidal,” see, e.g., *State v. Flippen*, 344 N.C. 689, 699 (1996) (no error to allow the State’s forensic pathologist expert to testify that the victim died as

a result of a “homicidal assault”); *State v. Parker*, 354 N.C. 268, 290 (2001) (citing *Flippen* and holding that it was not error to allow the State’s forensic pathologist expert to testify that the victim’s death was a homicide); *State v. Hayes*, 239 N.C. App. 539, 549-50 (2015) (no error to allow forensic pathology experts to testify that the cause of death was “homicide by unde[te]rmined means” and “homicidal violence”);

- an expert in psychiatry and addiction medicine to testify that the defendant lacked the capacity to form the specific intent to kill, see, e.g., *State v. Daniel*, 333 N.C. 756, 760-64 (1993) (trial court erred by excluding testimony from a defense expert to this effect; noting that although it has held that expert testimony regarding precise legal terms should be excluded, “specific intent to kill” is not one of those precise legal terms that is off limits);
- a mental health expert to testify that the defendant lacked the capacity to plan, think, or reflect, *Daniel*, 333 N.C. at 760-64 (first-degree murder case), that the defendant’s capacity to make and carry out plans was impaired, *State v. Shank*, 322 N.C. 243, 246-251 (1988) (new trial required in first-degree murder case where the trial court excluded this evidence); see also *State v. Fisher*, 336 N.C. 684, 704 (1994) (noting that a defense expert properly was allowed to opine regarding the defendant’s ability to formulate and carry out a plan), or that the defendant acted while under the influence of a mental or emotional disturbance, *Shank*, 322 N.C. at 246-51 (new trial required in a first-degree murder case where the trial court excluded this evidence);
- an expert to testify that the defendant acted with an intent to cause death, *State v. Teague*, 134 N.C. App. 702, 708–09 (1999) (proper to allow expert to opine that one of the victim’s “gunshot wounds to the head was consistent with an intent to cause death”);
- an endocrinologist, in a case involving a defense of automatism, to testify that the defendant’s actions were “not caused by automatism due to hypoglycemia” and that he reached this conclusion because the defendant did not experience amnesia, a characteristic feature of automatism caused by hypoglycemia, *State v. Coleman*, \_\_\_ N.C. App. \_\_\_, \_\_\_ S.E.2d \_\_\_ (July 18, 2017);
- a forensic pathologist who performed the autopsy to testify that the victim was “tortured,” where the defendant was charged with first-degree murder on the basis of torture, *State v. Jennings*, 333 N.C. 579, 597-600 (1993);
- a forensic pathologist who conducted the autopsy to testify that the victim experienced a “sexual assault,” *Jennings*, 333 N.C. at 600-601; see also *State v. O’Hanlan*, 153 N.C. App. 546, 553-57 (2002) (citing *Jennings* and holding that medical doctors who examined the victim properly testified that she was sexually assaulted);
- a pathologist who did the autopsy to testify that that defendant’s account of the shooting was inconsistent with the type of wound suffered by victim and that the wound was not a self-defense type wound, even though self-defense was an ultimate issue in the case, *State v. Saunders*, 317 N.C. 308, 314 (1986);

- a physician to testify that a sexual assault victim's injuries were caused by a male penis, *State v. Smith*, 315 N.C. 76, 99-100 (1985) (noting that the witness did not testify that the victim had been raped or that the defendant had raped her);
- a radiologist to testify, in an assault inflicting serious injury case, that based on the victim's CT scan, the "trauma was definitely very serious intracranial trauma with serious brain injury and serious orbital injury with all the bone damage that was suffered," *State v. Liggons*, 194 N.C. App. 734, 743-44 (2009) (concluding that the expert's opinion was not inadmissible on the basis that it embraced an ultimate issue to be determined by the jury).

However, it is improper to allow:

- an expert in pathology and medicine, in a homicide case, to testify that injuries suffered by the victim were a "proximate cause of [the victim's] death," *State v. Ledford*, 315 N.C. 599, 617-19 (1986) (error to allow the expert to testify that a legal standard—"proximate cause"—had been met);
- a mental health expert to testify, in a murder case, that a defendant did or did not premeditate or deliberate, *State v. Weeks*, 322 N.C. 152, 166-67 (1988) (proper to exclude defense proffered expert testimony that the defendant did not act with deliberation); *State v. Cabe*, 131 N.C. App. 310, 313-14 (improper to allow the State's expert to testify that the defendant acted with premeditation and deliberation, but allowable here where the defendant opened the door), or that the defendant possessed or lacked the capacity to premeditate or deliberate, *State v. Rose*, 323 N.C. 455, 459-60 (1988) (*Rose I*) (proper to exclude such testimony); *State v. Rose*, 327 N.C. 599, 601-05 (1990) (*Rose II*) (the trial court committed reversible error by allowing the State's expert to testify that the defendant was capable of "premeditating"); *State v. Mash*, 328 N.C. 61, 65-66 (1991) (proper to exclude defense proffered expert testimony regarding the defendant's ability to premeditate and deliberate);
- a mental health expert to testify, in a murder case, that the defendant did not act in a "cool state of mind," *Weeks*, 322 N.C. at 165-67; *State v. Boyd*, 343 N.C. 699, 708-10 (1996) (holding that under *Weeks* and Rule 403, the trial court did not err by preventing a forensic psychologist from using the phrase "cool state of mind" to convey his opinion that the defendant lacked the specific intent necessary to commit premeditated and deliberate murder at the time of the shootings), or under a suddenly aroused violent passion, *Weeks*, 322 N.C. at 165-67.
- a mental health expert to testify that the defendant lacked the capacity to conspire, *State v. Brown*, 335 N.C. 477, 489 (1994) (no error to exclude testimony of defense expert in forensic psychiatry with a specialty in addictive medicine where the term "conspiracy" had a specific legal definition);

- a medical doctor who examined the victim to testify that she had been “raped” and “kidnapped,” *State v. O’Hanlan*, 153 N.C. App. 546, 557-58 (2002);
- a mental health expert to testify about the law of voluntary intoxication and its effect on the defendant’s insanity defense, *State v. Silvers*, 323 N.C. 646, 655-57 (1989) (agreeing with the defendant’s argument that a defense expert was erroneously permitted to offer legal conclusions during cross-examination by the State).

**C. Opinion on Credibility of Witness.** Expert testimony on the credibility of a witness is not admissible. *State v. Heath*, 316 N.C. 337, 340-43 (1986) (holding that the expert’s testimony was improper for this reason); *State v. Aguallo*, 318 N.C. 590, 598-99 (1986) (citing *Heath* and holding that the trial court erred by allowing a pediatrician to testify that a rape victim was “believable”); *State v. Green*, 209 N.C. App. 669, 676-77 (2011) (so stating this rule but holding that in this case, the expert’s testimony regarding the defendant’s blood alcohol level did not constitute impermissible opinion testimony). Thus, it is error to allow an expert to testify that she believed the victim and to the reason for this belief. *State v. Teeter*, 85 N.C. App. 624, 631-32 (1987) (testimony by a nurse tendered as an expert for the State with respect to sexually abused mentally retarded adults). However, drawing the line between permissible and impermissible expert testimony in this area can be difficult. In *Teeter*, for example, it was not error for a mental health expert to testify that an adult sexual assault victim who suffered certain mental impairments showed no evidence of a disorder that would impair her ability to distinguish reality from fantasy. *Id.* at 628-29. The court rejected the defendant’s argument that this testimony amounted to an impermissible expert opinion concerning the victim’s credibility. *Id.* Consider by contrast, *Heath*, in which clinical psychologist Deborah Broadwell testified as an expert for the State in a child sexual assault case involving victim Vickie. At trial, defense counsel asked Vickie if her sister thought she was lying about the attack because Vickie “had lied about so many other things,” asked Vickie’s mother if she had experienced difficulties with Vickie “making up stories,” and cross-examined Broadwell about alleged discrepancies in Vickie’s statements to hospital emergency room and mental health clinic personnel. *Heath*, 316 N.C. at 339-40. On redirect, the prosecutor asked Broadwell: “do you have an opinion . . . as to whether or not Vickie was suffering from any type of mental condition . . . which could or might have caused her to make up a story about *the* sexual assault?” *Id.* at 340 (emphasis added). Broadwell responded: “There is nothing in the record or current behavior that indicates that she has a record of lying.” *Id.* The court held, in part that the question, focusing as it did on “*the* sexual assault,” was improper. It explained:

We would be confronted with an entirely different situation had the assistant district attorney . . . asked the psychologist if she had an opinion as to whether Vickie was afflicted with any mental condition which might cause her to fantasize about sexual assaults in general or even had the witness confined her response to the subject of a “mental condition.”

*Id.* at 341. But because the question focused on *the* specific incident in question, it was improper under Evidence Rules 608 and 405(a), which “together, forbid an

expert's opinion as to the credibility of a witness.” *Id.* at 342. *Heath* thus emphasizes how fine the line can be between permissible and impermissible testimony. See also *State v. O'Hanlan*, 153 N.C. App. 546, 555 (2002) (“[T]he cases dealing with the line between discussing one's expert opinion and improperly commenting on a witness' credibility have made it a thin one.”).

Issues regarding impermissible expert opinion testimony on the credibility of a witness arise most frequently in child sexual assault cases. For a more detailed discussion of this issue in that context see [Evidence Issues in Criminal Cases Involving Child Victims and Child Witnesses](#), in this Benchbook. For more decisions decided after publication of that Benchbook Chapter, see [Smith's Criminal Case Compendium](#) (under Evidence; Opinions; Experts; Sexual Assault Cases).

#### D. Basis for Expert's Opinion.

1. **Scope & Adequacy.** Evidence Rule 703 provides that “[t]he facts or data . . . upon which an expert bases an opinion or inference may be those perceived by or made known to him at or before the hearing.” N.C. R. EVID. 703. See generally *State v. Morgan*, 299 N.C. 191, 206 (1980) (testimony of Chief Medical Examiner regarding identification of human remains and cause of death was based on adequate data where the witness examined the remains, measuring, sorting and photographing them); *State v. McClary*, 157 N.C. App. 70, 79 (2003) (a forensic psychiatrist properly testified as an expert based on his own meetings with the defendant and his review of psychiatric evaluations done by other psychiatrists); *State v. McCall*, 162 N.C. App. 64, 71-73 (2004) (it was not error for an expert witness to testify that a child victim's behaviors suggested exposure to trauma, probably sexual abuse, where the expert did not personally examine the child; the expert obtained information about the child from a summary of the child's testimony, a DSS report, and the child's statement to the police; rejecting the defendant's argument that the expert's failure to examine the child rendered her expert opinion unreliable).

An opinion based on inadequate facts or data should be excluded. See 2 KENNETH S. BROUN, BRANDIS & BROUN ON NORTH CAROLINA EVIDENCE 742 (2011) [hereinafter BRANDIS & BROUN] (citing cases). As noted above, when expert testimony is not sufficiently tied to the facts of the case, it may fail the “fit test” that is part of the relevancy inquiry. See Section II.B.3. above.

2. **Of a Type Reasonably Relied Upon.** Rule 703 provides that the facts or data underlying the expert's opinion must be “of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject.” N.C. R. EVID. 703. Compare *State v. Demery*, 113 N.C. App. 58, 65-66 (1993) (State's forensic serologist expert properly relied on statistical information concerning the frequency of blood group factors or characteristics in the North Carolina population compiled by the SBI with blood provided by the Red Cross and blood obtained in criminal cases; “The statistics on which he relied are commonly used and accepted in his field in North Carolina, and similar statistics are commonly used and accepted in forensic serology throughout the country”), *State v. Purdie*, 93 N.C. App. 269, 275-76 (1989) (expert in accident

reconstruction properly based his opinion on physical evidence), *and* State v. Teeter, 85 N.C. App. 624, 628-30 (1987) (clinical psychologist and expert in adult mental retardation and sexual abuse properly testified to the opinion that the victim exhibited behavioral characteristics consistent with sexual abuse; his opinion was based upon his experience in treating sexually abused mentally retarded persons, his familiarity with research and literature in that field, and his personal examination of the victim, all sources reasonably relied upon by experts in the field), *with* State v. Galloway, 145 N.C. App. 555, 564-65 (2001) (the trial court properly excluded statements made by the State's expert in the victim's medical discharge summary referencing the victim's psychiatric history, including substance abuse; because the expert was qualified as an expert in surgery, not psychiatry, the court rejected the defendant's assertion that the statements were admissible under Rule 703, finding that they did not contain facts or data reasonably relied upon by experts in the field of surgery).

3. **Need Not Be Admissible.** Rule 703 provides that if of a type reasonably relied upon by experts in the field, the facts or data forming the basis of the expert's opinion "need not be admissible in evidence." N.C. R. EVID. 703; *see, e.g.,* State v. Jones, 322 N.C. 406, 410-14 (1988) (trial court did not err by admitting hearsay evidence as the basis of an expert's opinion); State v. Purdie, 93 N.C. App. 269, 277 (1989) (same).

For a discussion of confrontation clause issues related to the basis of the expert's opinion, see [Guide to Crawford and the Confrontation Clause](#), in this Benchbook.

4. **Expert Need Not Interview Victim.** Evidence Rule 703 provides that the facts or data on which an expert bases an opinion "may be those perceived by or made known to him at or before the hearing." N.C. R. EVID. 703; *see Purdie*, 93 N.C. App. at 276 ("It is well-settled that an expert witness need not testify from first-hand personal knowledge . . ."). Furthermore, the North Carolina Supreme Court has clarified that an expert "is not required to examine or interview the prosecuting witness as a prerequisite to testifying about issues relating to the prosecuting witness at trial," noting that "[s]uch a requirement would create a troubling predicament given that defendants do not have the ability to compel the State's witnesses to be evaluated by defense experts." State v. Walston, \_\_\_ N.C. \_\_\_, 798 S.E.2d 741, 747 (2017); *accord* State v. McCall, 162 N.C. App. 64, 71-73 (2004) (it was not error for an expert witness to testify that a child victim's behaviors suggested exposure to trauma, probably sexual abuse, where the expert did not personally examine the child; the expert obtained information about the child from a summary of the child's testimony, a DSS report and the child's statement to the police; rejecting the defendant's argument that the expert's failure to examine the child rendered her expert opinion unreliable).
5. **Disclosure & Cross-Examination of Basis at Trial.** Although an expert may testify without prior disclosure of the basis for his or her opinion, disclosure is required when requested by the other side. Rule 705 provides:

The expert may testify in terms of opinion or inference and give his reasons therefor without prior disclosure of the underlying facts or data, unless an adverse party requests otherwise, in which event the expert will be required to disclose such underlying facts or data on direct examination or voir dire before stating the opinion. The expert may in any event be required to disclose the underlying facts or data on cross-examination.

N.C. R. EVID. 705; see, e.g., *State v. Brown*, 101 N.C. App. 71, 76-77 (1990) (noting that under Rule 705 an expert does not have to identify the basis of his opinion, absent a specific request by opposing counsel; rejecting the defendant's argument that the State's failed to establish a proper foundation for its expert's opinion as to the weight of the cocaine where the expert testified to his opinion but the defendant made no inquiry as to basis on cross-examination); *State v. Fletcher*, 92 N.C. App. 50, 57 (1988) ("The basis of an expert's opinion need not be stated unless requested by an adverse party and here defendant made no such request.").

Courts have noted that "[d]isclosure of the basis of the opinion is essential to the factfinder's assessment of the credibility and weight to be given to it." *State v. Jones*, 322 N.C. 406, 412 (1988). If the party requesting disclosure does not specify disclosure on voir dire, the trial court probably can allow for disclosure on voir dire or direct examination without committing error. 2 BRANDIS & BROUN at 738 (so noting); see *State v. Pretty*, 134 N.C. App. 379, 382-83 (1999) (no error where disclosure occurred during direct and cross-examination rather than on voir dire and no prejudice was shown from the delay in obtaining the evidence). But, if the party seeking disclosure specifically asks for disclosure on voir dire and the trial court allows disclosure only on direct examination, prejudicial error may occur if improper evidence is presented to the jury. 2 BRANDIS & BROUN at 738. When disclosure is ordered through voir dire and the trial court admits the opinion, it has been suggested that the trial court has discretion to require the expert to state the facts or data before giving the opinion or leave them to be brought out on cross-examination. *Id.*

"Wide latitude is generally given to a cross-examiner in his attempts to discredit the expert witness, including questioning the expert in order to show that the facts or data forming the basis of the expert's opinion were incomplete." *State v. Black*, 111 N.C. App. 284, 293-94 (1993). As has been explained:

On cross-examination ... opposing counsel may require the expert to disclose the facts, data, and opinions underlying the expert's opinion not previously disclosed. With respect to facts, data, or opinions forming the basis of the expert's opinion, disclosed on direct examination or during cross-examination, the cross-examiner may explore whether, and if so how, the non-existence of any fact, data, or opinion or the existence of a contrary version of the fact, data, or opinion supported by the evidence, would affect

the expert's opinion. Similarly the expert may be cross-examined with respect to material reviewed by the expert but upon which the expert does not rely. Counsel is also permitted to test the knowledge, experience, and fairness of the expert by inquiring as to what changes of conditions would affect his opinion, and in conducting such an inquiry ... the cross-examiner is not limited to facts finding support in the record. It is, however, improper to inquire of the expert whether his opinion differs from another expert's opinion, not expressed in a learned treatise, if the other expert's opinion has not itself been admitted in evidence. An expert witness may, of course, be impeached with a learned treatise, admissible as substantive evidence . . . .

*Id.* at 294 (quoting MCCORMICK, MCCORMICK ON EVIDENCE § 13 (1992), and going on to hold that the trial court properly allowed the defendant to elicit on cross-examination that the expert never examined certain medical records, that in formulating similar opinions she often relied upon such records, and that examination of the records would in fact have assisted the expert in formulating her opinion in this case; however, the trial could properly limit the defendant's cross-examination when he sought to question the expert regarding the contents of data that the expert had not considered or used in formulating her opinion and which was not contained in any recognized learned treatise); see also *State v. White*, 343 N.C. 378, 393 (1996) (the trial court properly allowed the State to cross-examine a defense psychiatry expert about the work of a clinical psychologist upon which the expert had relied where the expert disagreed with a conclusion drawn by the clinical psychologist).

Cases have held it to be error when the trial court prohibits defense counsel from asking a defense expert about the basis of his or her opinion. *State v. Davis*, 340 N.C. 1, 25-26 (1995) (error to sustain the State's objections to questions posed to the defendant's mental health expert about the basis of the expert's opinion); *State v. Allison*, 307 N.C. 411, 413-17 (1983) (the trial court committed prejudicial error in a case involving the insanity defense where it prohibited defense mental health experts from testifying to the basis of their opinions that the defendant was unable to distinguish between right and wrong with respect to his behavior at the time of the alleged crimes).

For a discussion of what discovery must be provided in connection with expert witnesses, see [Discovery in Criminal Cases](#) in this Benchbook.

- 6. Status as Substantive Evidence; Limiting Instruction.** When evidence is admissible as the basis of an expert's opinion, it is not substantive evidence unless it qualifies for admission under some independently recognized principle, such as an exception to the hearsay rule. 2 BRANDIS & BROUN at 744-45. One exception to the hearsay rule that might apply is N.C. R. EVID. 803(18) (hearsay exceptions, availability of declarant immaterial), which provides an exception to the hearsay rule as follows:

To the extent called to the attention of an expert witness upon cross-examination or relied upon by him in direct

examination, statements contained in published treatises, periodicals, or pamphlets on a subject of history, medicine, or other science or art, established as a reliable authority by the testimony or admission of the witness or by other expert testimony or by judicial notice. If admitted, the statements may be read into evidence but may not be received as exhibits.

If the evidence does not qualify for admission as substantive evidence, its admission should be accompanied by an appropriate limiting instruction. See *State v. Jones*, 322 N.C. 406, 414 (1988) (noting that the defendant is entitled to a limiting instruction upon request).

**E. Testimony Outside of Expert's Expertise.** An expert's testimony should relate to the expert's area of expertise. *State v. Ward*, 364 N.C. 133, 146 n.5 (2010) ("[c]aution should be exercised in assuring that the subject matter of the expert witness's testimony relates to the expertise the witness brings to the courtroom" (quotation omitted)). For example, in one recent case the North Carolina Supreme Court noted that while a defense proffered witness who was a former police officer and trainer in police use of force matters would have been qualified to testify about standard police practices regarding the use of force, he was not qualified to testify about the human body's sympathetic nervous system. *State v. McGrady*, 368 N.C. 880, 896 (2016). By contrast, in another case the Court of Appeals rejected the defendant's argument that testimony by a forensic serologist that the defendant's blood profile was the same as .2% of the population and the victim's blood profile was the same as 8.2% of the population was beyond the scope of witness's expertise. *State v. Demery*, 113 N.C. App. 58, 63-64 (1993).

**F. Terminology.**

Although not binding authority for a judge, the PCAST REPORT asserts that statements by experts suggesting or implying greater certainty than is shown by the empirical evidence "are not scientifically valid and should not be permitted." PCAST REPORT at 145. It continues:

In particular, courts should never permit scientifically indefensible claims such as: "zero," "vanishingly small," "essentially zero," "negligible," "minimal," or "microscopic" error rates; "100 percent certainty" or proof "to a reasonable degree of scientific certainty;" identification "to the exclusion of all other sources;" or a chance of error so remote as to be a "practical impossibility."

*Id.*; see also Paul C. Giannelli, *The NRC Report and Its Implications for Criminal Litigation*, 50 JURIMETRICS J. 53, 57-60 (2009) (discussing a similar position in the 2009 report by the National Research Council, entitled, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD, and relevant cases).

**IV. Interplay Between Rule 403 & the 700 Rules.** Evidence that is admissible under Rule 702 still may be inadmissible under Rule 403. See N.C. R. EVID. 702(g) ("This section

does not limit the power of the trial court to disqualify an expert witness on grounds other than the qualifications set forth in this section.”). *Compare, e.g., State v. King*, 366 N.C. 68, 75-76 (2012) (holding that the trial court did not abuse its discretion by excluding under Rule 403 the expert testimony regarding repressed memory that was admissible under Rule 702), *and State v. Walston*, \_\_\_ N.C. \_\_\_, 798S.E.2d. 741, 746 (2017) (citing *King* and noting that Rule 403 would allow for the exclusion of expert testimony—in that case, regarding repressed memory and the suggestibility of memory—even if such evidence was admissible under Rule 702), *with State v. Cooper*, 229 N.C. App. 442, 463 (2013) (in this murder case where files recovered from the defendant’s computer linked the defendant to the crime, the trial court abused its discretion by excluding under Rule 403 a defense expert proffered to testify that the defendant’s computer had been tampered with).

Likewise, evidence admissible under Rule 705 may be excluded under Rule 403. *State v. Coffey*, 336 N.C. 412, 420-22 (1994) (although Rule 705 allows a party cross-examining an expert to inquire into the facts on which the expert’s opinion is based, that Rule “does not end the inquiry” and the trial court may exclude such evidence under Rule 403; where the probative value of evidence of the defendant’s convictions was substantially outweighed by the danger of unfair prejudice, evidence of the convictions was not admissible on grounds that they constituted a basis of the expert’s opinion).

**V. Court Appointed Experts.** Evidence Rule 706(a) provides for court appointed experts. It provides:

The court may on its own motion or on the motion of any party enter an order to show cause why expert witnesses should not be appointed, and may request the parties to submit nominations. The court may appoint any expert witnesses agreed upon by the parties, and may appoint witnesses of its own selection. An expert witness shall not be appointed by the court unless he consents to act. A witness so appointed shall be informed of his duties by the court in writing, a copy of which shall be filed with the clerk, or at a conference in which the parties shall have opportunity to participate. A witness so appointed shall advise the parties of his findings, if any; his deposition may be taken by any party; and he may be called to testify by the court or any party. He shall be subject to cross-examination by each party, including a party calling him as a witness.

N.C. R. EVID. 706(a); *see also State v. Robinson*, 368 N.C. 596, 597 (2015) (instructing that on remand the trial court may, in its discretion appoint an expert under the rule).

If the court appoints an expert, the witness is “entitled to reasonable compensation in whatever sum the court may allow.” N.C. R. EVID. 706(b).

The rule allows the court, in the exercise of its discretion, to “authorize disclosure to the jury of the fact that the court appointed the expert witness.” N.C. R. EVID. 706(c). And it specifies that nothing in the rule limits the parties in calling expert witnesses of their own selection. N.C. R. EVID. 706(d).

**VI. Defendant’s Right to Expert Assistance.**

For a discussion of a criminal defendant’s right to expert assistance and the procedure for obtaining such assistance, see Chapter 5, Experts and Other Assistance, in JOHN

RUBIN & ALYSON A. GRINE, NORTH CAROLINA DEFENDER MANUAL VOL. 1, PRETRIAL (2013), <http://defendermanuals.sog.unc.edu/defender-manual/2>.

**VII. Standard of Review on Appeal.**

In reviewing a trial court's decision regarding the admissibility of expert testimony, the appellate courts apply the deferential abuse of discretion standard. *See, e.g., Walston*, \_\_\_ N.C. \_\_\_, 798 S.E.2d at 745; *McGrady*, 368 N.C. at 893; *State v. Babich*, \_\_\_ N.C. App. \_\_\_, 797 S.E.2d 359, 361 (2017); *State v. Hunt*, \_\_\_ N.C. App. \_\_\_, 790 S.E.2d 874, 881 (2016).