DAUBERT'S BIPOLAR TREATMENT OF SCIENTIFIC EXPERT TESTIMONY—FROM *FRYE*'S POLYGRAPH TO FARWELL'S BRAIN FINGERPRINTING

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I. INTRODUCTION

American courts acknowledge "law lags science."[1] This is understandable in that science should not be tested in our legal adversarial system at the expense of individual liberty. However, this Note argues the appropriate lag is exaggerated by the legal profession's hostility toward, or ignorance of, sound scientific advances. This leads to inconsistent treatment of scientific expert testimony. The United States' adversarial legal system and professed faith in the jury system should by necessity assume a willingness to embrace scientific advances that will likewise advance justice. By responding instead with an unwillingness to consider and accept updated scientific findings, American courts persist in making two significant mistakes. First, and most obvious: by resisting scientific advances, courts keep new approaches from entering the courtroom. Second, and seemingly less noticed: by shutting out new approaches, courts sometimes cling to outdated scientific methods and allow flawed science to come into the courtroom. Keeping science at arm's length serves to hinder the introduction of sound evidence and perpetuate faulty scientific application. This no doubt encumbers, rather than advances, the interest of justice.

This Note will first briefly explain the development of expert testimony and scientific evidence in the American court system. From there, the Note considers the evolution of the polygraph, and focuses primarily upon two kinds of polygraph: the control question test (CQT) and the guilty knowledge test (GKT). This Note argues that, as opposed to the deficient CQT application, the GKT has been shown to be reliable and accepted within the scientific community, and should pass the expert testimony analysis mandated by the Supreme Court in *Daubert v. Merrell Dow Pharmacedutricals, Inc.*[2]

Courts remain reluctant to admit polygraph evidence, but after

1. *E.g.*, Ingram v. Solkatronic Chem., Inc., No. 04-CV-0287-CVE-PJC, 2005 WL 3544244, at *9 (N.D. Okla. Dec. 28, 2005) ("'Law lags science; it does not lead it.'" (quoting Rosen v. Ciba-Geigy Corp., 78 F.3d 316, 319 (7th Cir. 1996))); Wyeth, Inc. v. Gottlieb, 930 So. 2d 635, 642 (Fla. Dist. Ct. App. 2006) (same).

2. Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 592–95 (1993).

Daubert, most courts will admit it upon stipulation and may at least consider the evidence before flatly rejecting it. However, when U.S. courts have been open to considering polygraph evidence, the evidence and analyses almost always derive from the CQT application rather than the more scientifically sound GKT application. This Note argues that rejection of polygraph evidence generically is the result of flawed courtroom critiques that focus on the CQT method of polygraph and fail to distinguish the scientifically viable GKT. This Note examines such flawed assessments in two court cases providing in-depth analyses of polygraph evidence.

This Note next argues a further improvement of the already sound GKT would be an application of the GKT involving involuntary brain responses as evidencing guilty knowledge. This Note addresses the criticisms of this technology, and contends these criticisms are misplaced. First, the new application of the GKT demonstrates solid scientific footing and shows little vulnerability to countermeasures. Second, any subjectivity involved in the process can be separated from the scientific components of the procedure. This Note suggests subjectivity should not render evidence inadmissible, pointing to the subjectivity involved in other forms of expert testimony consistently allowed in court, particularly in regard to latent fingerprint testimony. In conclusion, this Note calls upon courts and practitioners to become more science-savvy and avoid unnecessarily exaggerating the lag between law and science.

Law *should* lag science, but at a more appropriate distance.

II. THE DEVELOPMENT OF EXPERT WITNESS TESTIMONY ADMISSIBILITY IN U.S. COURTS

The history of admissibility standards for expert testimony essentially began with the D.C. Circuit Court case, *Frye v. United States*.[3] *Frye* established the old rule for admissibility of expert witness testimony regarding scientific evidence, holding such evidence admissible if based on methods deemed reliable and generally accepted within the appropriate scientific community.[4] Thus, under *Frye*, new technology or novel scientific

3. Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).

4. *Id.* at 1014. The famed verbiage in *Frye* states:

> Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the

practices were quite difficult to bring into court.[5] The *Frye* test remained the standard for seventy years, until the United States Supreme Court decided *Daubert*.[6] *Daubert* established that the Federal Rules of Evidence, promulgated in 1972, trumped the *Frye* test and that the Rules oblige trial judges to "ensure that any and all scientific testimony . . . is not only relevant, but reliable."[7] Rule 702 controls expert testimony and allows the admission of scientific expert testimony if it "will assist the trier of fact to understand the evidence or to determine a fact in issue, [and] a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise."[8] The Rule was amended in 2000, adding to the above-stated rule the following language: "if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case."[9]

The *Daubert* Court also provided a non-exhaustive list of factors for trial judges to consider in their gatekeeping roles of determining whether expert testimony based on scientific evidence is admissible.[10] The "general observations" the Court laid out include, "whether a theory or technique . . . can be (and has been) tested" under the scientific method;[11] whether it "has been subjected to peer review and publication;"[12] the "known or potential rate of error" of a particular technique and "the existence and maintenance of standards controlling the technique's operation;"[13] and the court may also, but is not required to, consider a technique's "general acceptance" within the "'relevant scientific community and an express determination of a particular degree of acceptance within that

> deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.

Id.; *see also Daubert*, 509 U.S. at 585–87 (explaining the evolution of admissibility standards of expert testimony).

5. *See, e.g.*, Nathan Benedict, Note, *Fingerprints and the* Daubert *Standard for Admission of Scientific Evidence: Why Fingerprints Fail and a Proposed Remedy*, 46 ARIZ. L. REV. 519, 522–24 (2004) (discussing the admissibility of fingerprint evidence under the *Frye* test).

6. *Daubert*, 509 U.S. at 585.

7. *Id.* at 589.

8. FED. R. EVID. 702.

9. *Id.*

10. *Daubert*, 509 U.S. at 593–94.

11. *Id.* at 593.

12. *Id.*

13. *Id.* at 594.

community.'"[14]

Kumho Tire Co. v. Carmichael broadened the *Daubert* reasoning, holding the same gatekeeping standards for establishing reliability apply to nonscientific (technical or specialized) evidence as well.[15] The advisory committee note for the 2000 amendment responded to the Court's decisions in *Daubert* and *Kumho*.[16] Thus, the current version of Rule 702 establishes trial judges are "gatekeepers" who must determine the reliability of expert testimony; this function applies to all expert witness testimony, and the *Daubert* considerations do not constitute an all-inclusive list.[17] The *Daubert* Court noted Rule 403 allows for exclusion of even relevant evidence when introduction of it would be prejudicial—particularly because of the power of expert testimony—and granted trial judges more control over expert, rather than lay, witnesses.[18] Thus, the Court appeared to be advocating a relatively strict standard of review. However, the Court later held in *General Electric Co. v. Joiner* that abuse of discretion was the appropriate review for a trial court's decision whether to admit or prohibit expert scientific evidence.[19] *Joiner* countered *Daubert*'s suggestion that the weightiness of an expert's testimony required a closer look at district court rulings.[20] This relaxed standard of review regarding trial judge's gatekeeping function has led to inconsistency across jurisdictions as to what is, or should be, admissble.[21]

Daubert requires courts to become more proficient in their understanding of science.

> The present discussion of the fit, or lack thereof, between the current

14. *Id.* (quoting United States v. Downing, 753 F.2d 1224, 1238 (3d Cir. 1985)).

15. Kumho Tire Co. v. Carmichael, 526 U.S. 137, 141 (1999).

16. FED. R. EVID. 702 advisory committee note to 2000 Amendment.

17. *Id.* The committee note explains the *Daubert* list is "neither exclusive nor dispositive. Other cases have recognized that not all of the specific *Daubert* factors can apply to every type of expert testimony." *Id.* The committee note provides additional factors that may be relevant in the reliability determination. *Id.*

18. *Daubert*, 509 U.S. at 595 ("Expert evidence can be both powerful and quite misleading because of the difficulty in evaluating it. Because of this risk, the judge in weighing possible prejudice against probative force under Rule 403 of the present rules exercises more control over experts than over lay witnesses.").

19. Gen. Elec. Co. v. Joiner, 522 U.S. 136, 139 (1997).

20. *See generally id.* The net effect of *Joiner* was to not closely scrutinize district court rulings.

21. This Note will discuss the differing approaches to admitting polygraph evidence.

> view of scientific validity among psychologists and behavioral scientists and the *Daubert* criteria make clear how complex it is to apply scientific principles in the legal framework. . . . Drawing inferences from research requires complex judgments about the adequacy of the methodology and the degree to which plausible alternative explanations can be rejected. Moreover, scientific validation requires not only that one assess empirical evidence; rather, both the theoretical foundation and the evidence that either support or contradict it need to be jointly assessed. Thus, although *Daubert* requires courts to make scientific judgments, the two systems of thought—legal and scientific—are not easily aligned.[22]

As will be argued throughout this Note, if *Daubert* criteria are to be applied, "social scientists and courts [need] to develop a mutually understood language to assess validity claims. Courts must have the ability to weigh scientific evidence and, although they need not become amateur scientists, they must become sophisticated consumers."[23]

III. THE EVOLUTION OF THE POLYGRAPH

The simple fact remains: crimes would be much easier to solve if we knew when the bad guy was lying.

In reality, lying is a vital component of human development, and people usually begin lying before turning five years old.[24] Indeed, psychologists admit "'[l]ying is just so ordinary, so much a part of our everyday lives and everyday conversations,' that we hardly notice it."[25] One popular theory contends that humans' higher intelligence and increasingly complex social interactions induced deception within our social species.[26] The evolution of human interaction and intelligence mandated social manipulation.[27]

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22. L. Saxe & Gershon Ben-Shakhar, *Admissibility of Polygraph Tests: The Application of Scientific Standards Post*-Daubert, 5 PSYCHOL. PUB. POL'Y & L. 203, 217 (1999).

23. *Id.* at 203.

24. Robin Marantz Henig, *Looking for the Lie*, N.Y. TIMES, Feb. 5, 2006, (Magazine), at 76.

25. *Id.* (quoting Bella DePaulo, a University of California, Santa Barbara, psychologist).

26. *See* MACHIAVELLIAN INTELLIGENCE II: EXTENSIONS & EVALUATIONS 2–3 (Andrew Whiten & Richard W. Byrne eds., 1997) (explaining the origins of the Machiavellian Intelligence Hypothesis).

27. *Id.*

"For as long as human beings have deceived each other, people have tried to develop techniques for detecting deception and determining truth."[28] As technology advanced, a number of methods developed to detect dishonesty by measuring physiological responses as signals of deception, and the polygraph became the most well-known method to expose a liar.[29] Human beings have for thousands of years attempted to detect lies by taking note of physical manifestations of deception,[30] and in 1895, the first "scientific" approach to lie detection surfaced when Cesare Lombroso tried to uncover lies using a tool to read blood pressure.[31] More recently, technological advances have helped psychologists and scientists more effectively study polygraph techniques, which should lead to a greater willingness to consider such tools after *Daubert*.[32] The current status of the polygraph and related branches of technology derives from a much different framework than it did in the past: "[s]cience has come a long way since the days of the systolic blood pressure machine at issue in the *Frye* case."[33]

"Let us briefly repeat the widely known fact that the term *polygraph* refers to a technical device for recording, in several channels, an individual's autonomic activities associated with certain questions or the responses elicited by those questions."[34] Courts in the last two decades

28. BD. ON BEHAVIORAL, COGNITIVE, & SENSORY SCIS. & EDUC. COMM. ON NAT'L STATISTICS, THE POLYGRAPH & LIE DETECTION 11 (2003) [hereinafter NAS Report].

29. *See, e.g.*, *id.* ("In the 20th century, lie detection took on scientific aspects with the development of techniques that use measures of physiological responses as indicators of deception. The best known of these is the polygraph.").

30. Shauna Fleming Askins, Comment, United States v. Scheffer*: An Anomaly in the Military or a Return to the Per Se Ban on Polygraph Evidence?*, 37 HOUS. L. REV. 175, 176 (2000) ("More than four thousand years ago, the Chinese tried the accused in the presence of a physician, who listened for changes in heartbeat to determine whether the witness was testifying truthfully."); *see also* MCCORMICK ON EVIDENCE § 206 (Kenneth S. Broun ed., 6th ed. 2006).

31. State v. Brown, 687 P.2d 751, 770 (Or. 1984).

32. *See* United States v. Posado, 57 F.3d 428, 434–35 (5th Cir. 1995) (holding that after *Daubert* a per se ban on polygraph evidence is inappropriate); United States v. Piccinonna, 885 F.2d 1529, 1535 (11th Cir. 1989) (commenting on the polygraph's "increasingly widespread acceptance as a useful and reliable scientific tool" because of technological advances).

33. Askins, *supra* note 30, at 216; s*ee also Piccinonna*, 885 F.2d at 1535 (holding that a per se exclusion would be inappropriate because the polygraph has become recognized as a relatively reliable tool, even though the expert testimony should not be allowed in this case).

34. Klaus Fiedler et al., *What Is the Current Truth About Polygraph Lie*

have been slightly more willing to consider polygraph evidence, but arguments asserted in the legal community for admitting polygraph evidence at trial mischaracterize the technologies actually available in the scientific community.[35] Part of the problem is the fact that the polygraph technique most frequently used in the United States is one of the least reliable polygraph methods available.[36] However, some of the most reliable guilty knowledge tests are either not used, [37] not allowed,[38] or face heightened scrutiny and flawed analyses in court.[39] There exist countless examples in which courts could have gone beyond simply discrediting "polygraphs" generally by examining the value of the particular method of polygraph employed.[40] Without such explanations or analyses, a court opinion is of limited worth in improving the kind of evidence offered.

A. *Relevant-Irrelevant Test*

One modern-day polygraph test uses a yes-no question format in the form of relevant and irrelevant questions and is known as the Relevant-Irrelevant Test (RIT).[41] Relevant questions deal expressly with the issue

Detection?, 24 BASIC & APPLIED SOC. PSYCHOL. 313, 313 (2002).

35. *See, e.g.*, State v. Porter, 698 A.2d 739, 763 n.45 (Conn. 1997) (banning the use of both the CQT as well as the GKT, essentially saying the GKT is as controversial as the CQT). As will be highlighted in this Note, the CQT is much less reliable than the GKT. *See infra* Part III.B–C.

36. *See, e.g.*, William G. Iacono & David T. Lykken, *The Case Against Polygraph Tests*, *in* 4 MODERN SCIENTIFIC EVIDENCE § 40:55, at 610 (David L. Faigman et al. eds., 2005–2006) ("[T]he theory of the CQT is not scientifically plausible.").

37. *E.g.*, Lee v. Martinez, 96 P.3d 291, 295–96 (N.M. 2004) (noting that the GKT is primarily used in investigations, implying it is not used in court). See *infra* Part III.C for a discussion of these methods.

38. *See, e.g.*, *Porter*, 698 A.2d at 763 n.45 (the GKT cannot be used as evidence). See *infra* Part III.C for a discussion of these methods.

39. *See* Slaughter v. State, 105 P.3d 832, 835 (Okla. Crim. App. 2005) (stating there is "no real evidence that Brain Fingerprinting has been extensively tested" or that it is generally accepted).

40. *See generally* A. Farber & Partners, Inc. v. Garber, 417 F. Supp. 2d 1143, 1148 (C.D. Cal. 2006) (noting that the district court has "wide discretion" in barring polygraph testimony). The court went on to say that "in the Ninth Circuit, 'district courts are free to reject the admission of polygraph evidence on the basis of any applicable rule of evidence without analyzing all other potential bases of exclusion.'" *Id.* Thus, courts are willing to reject polygraph evidence in the generic sense without a searching analysis as to which kind of polygraph evidence is offered.

41. Charles R. Honts et al., *Scientific Status*, *in* 4 MODERN SCIENTIFIC EVIDENCE § 40:21 (David L. Faigman et al. eds., 2d ed. 2005–2006).

that is being investigated, and irrelevant questions are neutral.[42] The test is based on physiological responses, such as a change in blood pressure or respiration, assuming that if a subject lies when answering, the reaction to relevant questions (e.g., "Did you kill Bob?") will be stronger than the reaction to irrelevant questions (e.g., "Are you standing?").[43] "Although still practiced by some polygraphers today, the relevant-irrelevant test is almost universally rejected in the literature."[44] Though its use eventually became prevalent, there was really no evidence that the RIT method was accurate in detecting dishonesty.[45] There is a tremendous problem with false-positives (innocent labeled as guilty) when using the RIT, which means truthful people are frequently mislabeled as being deceptive.[46] Studies indicate that it is incredibly difficult to find any reliability in the RIT.[47] Thus, the RIT has been widely discredited and few courts that truly understand the underlying science, or lack thereof, would admit such evidence or expert testimony. Despite its criticism, federal agencies such as the Federal Bureau of Investigation as well as the National Security Agency still regularly use the RIT.[48]

Interestingly, although it is the least reliable, the RIT technique likely springs into the mind of most laypersons when they hear the word "polygraph." While polygraph results based on the RIT method are clearly suspect, how many courts delve deeply enough into available technologies to assess whether this deeply flawed technique is the method used when polygraph evidence is offered by stipulation? Frequently, courts refer

42. *Id.* An example of a relevant question would be a straightforward inquiry such as, "Did you steal Mary's car?," whereas an irrelevant question could be something like, "Are you 30 years old?" *See id.*

43. *Id.*; *see also* Askins, *supra* note 30, at 180.

44. State v. Porter, 698 A.2d 739, 762 n.43 (Conn. 1997) (citations omitted). The court noted in its analysis that the record did not specify whether the polygraph administered was an RI test or a CQT, but the court assumed a CQT was conducted. *Id.* at 760 n.39.

45. *See* Honts et al., *supra* note 41, § 40:21 (commenting on the technique's flaws, saying the "[m]ost serious is the naive and implausible rationale underlying the test").

46. *See id.* (expecting the RIT to elicit "a large percentage of incorrect decisions on truthful subjects (false positives)").

47. *See* Steven W. Horowitz et al., *The Role of Comparison Questions in the Physiological Detection of Deception*, 34 PSYCHOPHYSIOLOGY 108, 112 (1997) (citing a meager twenty-two percent of innocent participants who could be correctly identified as innocent); Frank S. Horvath, *The Utility of Control Questions and the Effects of Two Control Question Types in Field Polygraph Techniques*, 16 J. POLICE SCI. & ADMIN. 198, 205 (1988) (reporting a study in which no innocent participants passed the RIT).

48. Honts et al., *supra* note 41, § 40:21.

simply to a "polygraph test" or "polygraph results"[49] without acknowledging the actual method used. When referred to in such a generic sense, one can only guess which technique was used.

B. *Control Question Test*

In response to some of the weaknesses of the RIT, the control question test (CQT) was developed, and it remains the most commonly used test today.[50] Using the CQT, examiners compare responses to relevant questions with responses from control questions, and control questions are essentially worded to elicit a lie from anyone who takes the test.[51] Therefore, the CQT rests on the theory that innocent subjects have a stronger response to control questions because they will be nervous and somewhat uncertain about those answers.[52] Liars, on the other hand, should have a stronger response to the relevant questions because they must answer these questions dishonestly.[53] Thus, for a theft,

> the [control] question might be, "Have you ever stolen anything in the last twenty-five years?" The theory is that innocent subjects will react more strongly to the control questions and, thus, will be considered truthful. The guilty subjects are thought to react more strongly to the [more crime-specific] relevant questions and, thus, will be considered untruthful.[54]

However, "the so-called control questions actually used do not serve as strict controls in the scientific sense of the term" because there is no way

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49. *See, e.g.*, United States v. Swayze, 378 F.3d 834, 836–37 (8th Cir. 2004). Defendant Swayze sought a new trial based partly on newly discovered evidence: A defense witness had passed a polygraph test. *Id.* No attempts were made to clarify the kind of test that was conducted; the record only indicated it consisted of three yes-or-no type questions. *See id.* at 836.

50. *See* Askins *supra* note 30, at 181 ("The Control-Question Test (CQT) is the most commonly administered polygraph test."); Honts et al., *supra* note 41, § 40:22 ("To overcome the weaknesses of the RIT, [John E.] Reid devised the control question test (CQT).").

51. Fiedler et al., *supra* note 34, at 314 (noting the CQT assumes questions can be worded to make anyone lie).

52. Honts et al., *supra* note 41, § 40:22.

53. *Id.*

54. Askins, *supra* note 30, at 181 (citing David C. Raskin et al., *The Scientific Status of Research on Polygraph Techniques: The Case for Polygraph Tests*, *in* 1 MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY § 14-2.1.2, at 567–70 (David L. Faigman et al. eds., 1997)).

to compare how those questioned would react if they were being honest.[55] Still, many claim the CQT improved upon the RIT because the CQT focuses on the innocent's reaction to irrelevant questions rather than the guilty's response to relevant questions.[56] Therefore, proponents of the CQT assume there are fewer false-positive errors when using the CQT.[57] This form of polygraph "clearly does not detect lies. What it does is measure various physiologic responses which are precipitated by emotional reactions."[58]

It is important to note the United States criminal justice system's use of the CQT does not make it the most reliable method.[59] The CQT has been "extensively debated" within the scientific community, and "[c]ritics of the CQT have argued this method is not based on solid scientific principles and relies on improper control questions, thereby enhancing the risk of false-positive errors . . . . In addition, it is not standardized and therefore is vulnerable to various biases."[60] Furthermore, "effective countermeasures against the CQT are easily learned and . . . no effective means of defeating such tactics have" been identified.[61]

C. *Guilty Knowledge Test*

The GKT, unlike the CQT, does not depend upon the subject's

55. Iacono & Lykken, *supra* note 36, § 40:73; *see also* Askins, *supra* note 30, at 181. The "control" questions can only "provide an estimate of how innocent subjects would react if their answers to relevant questions were actually deceptive." Honts et al., *supra* note 41, § 40:22. "A true control in a scientific experiment usually represents a non-stimulated, or non-affected state that is maintained for comparison. The closest thing to that in polygraph testing is probably a neutral question, often mistakenly identified as a control by persons unfamiliar with polygraph testing." 42 AM. JUR. TRIALS § 48, at 366 (1991 & Supp. 2005).

56. Honts et al., *supra* note 41, § 40:22.

57. *See id.* (noting how control questions can provide estimates of an innocent subject's reaction to answering a relevant question deceptively).

58. State v. Brown, 687 P.2d 751, 760 (Or. 1984). In his testimony, psychologist Dr. Stanley Abrams further explained that the emotional reaction "might be mostly probably fear, fear of being caught in a lie, but it might also be conflict. It might also be simply an increase in emotional responsiveness." *Id.*

59. *See, e.g.*, Gershon Ben-Shakhar & Eitan Elaad, *The Validity of Psychophysiological Detection of Information with the Guilty Knowledge Test: A Meta-Analytic Review*, 88 J. APPLIED PSYCHOL. 131, 131 (2003) (noting that the CQT is the most popular form of polygraph in the United States, even though it "has been extensively debated in the scientific literature").

60. *Id.* at 131–32 (citations omitted).

61. Iacono & Lykken, *supra* note 36, § 40:59.

emotions.[62] Instead, the conventional GKT depends primarily upon orienting responses,[63] or a "cognitive processing associated with memory, something that *can* be determined using psychophysiological procedures."[64] The GKT assesses knowledge about a crime only the perpetrator should possess.[65] In other words, a GKT does not attempt to measure emotions when someone is lying, but rather, it measures involuntary responses associated with memory—generally detecting a response to something unfamiliar.[66]

The GKT is most often described as a multiple choice test, with the questions all relating to the issue being tested (i.e., a crime).[67] The perpetrator of the crime should be the only subject who could identify the one "correct" ("relevant") answer among the other irrelevant answers.[68] An example of such a question might be: Frank was killed with a pipe, a pistol, a knife, or by strangulation.[69] Sometimes the subject is told to respond "no" to each answer, asked to say nothing, or perhaps repeat the question.[70]

> The suspect's physiological responses [e.g., skin conductance responses or patterns of respiration] to the correct details are compared to those elicited by the incorrect ones . . . . A pattern of consistently stronger

62. *Id.* § 40:106.

63. *See, e.g.*, Gershon Ben-Shakhar & Eitan Elaad, *The Guilty Knowledge Test (GKT) as an Application of Psychophysiology: Future Prospects and Obstacles*, *in* HANDBOOK OF POLYGRAPH TESTING 87 (Murray Kleiner ed., 2002).

64. Iacono, *supra* note 36, § 40:106 (emphasis added).

65. *Id.* § 40:107.

66. *See id.* § 40:106 (noting that the first GKTs measured galvanic skin responses).

67. *E.g.*, *id.* § 40:107; *see also* Askins, *supra* note 30, at 182 ("The GKT consists of a series of multiple-choice questions that addresses different aspects of a specific crime."); Gershon Ben-Shakhar et al., *Trial by Polygraph: Reconsidering the Use of the Guilty Knowledge Technique in Court*, 26 LAW & HUM. BEHAV. 527, 529 (2002) ("For a prototypical GKT, a series of questions is prepared which could pertain to various aspects of the crime.").

68. *See generally* Askins, *supra* note 30, at 182 (noting that guilty subjects will likely have a stronger reaction to the correct answer than innocent subjects who will respond similarly to all answers); Ben-Shakhar et al., *supra* note 67, at 529.

69. *See generally* 42 AM. JUR. TRIALS § 55, at 374 (1991 & Supp. 2005) ("It is common practice to run several 'known solution' peak of tension tests [GKTs] on different aspects of a case, to assure accuracy. In the above example, a second test might focus on where the suspect entered the dwelling: front door, back door, basement window, bedroom window, and so on."); Askins, *supra* note 30, at 182; Ben-Shakhar et al., *supra* note 67, at 529.

70. Ben-Shakhar et al., *supra* note 67, at 529.

> responses elicited by the correct details than by the distractors is interpreted as an indication that the examinee recognizes these details. Thus, it is the existence of so-called "guilty knowledge," not of guilt itself, that the GKT attempts to detect.[71]

This involuntary response is the orienting response and "habituation process" humans experience. Such responses have been studied for decades; Lykken recognized their potential for exposing guilty knowledge in 1974.[72] "The GKT has been extensively researched during the past [three] decades."[73] The science behind the GKT is well-established, and in the context of criminal justice, the GKT essentially "links a suspect to a crime through that suspect's cognitions, rather than through emotions, as in the CQT."[74] This cognitive response to relevant and irrelevant stimuli illustrates the value of the GKT: the truthful subjects remain cognitively unaware of the relevant stimuli in a GKT, but even innocent subjects cognitively know which stimuli are relevant in a CQT.[75] Thus, the incorrect/irrelevant stimuli provide true scientific controls in a conventional GKT based on this cognitive distinction.[76] Unfortunately, countermeasures are capable of defeating a GKT, but countermeasures only affect false-negatives (guilty labeled as innocent).[77]

IV. ADMISSIBILITY OF POLYGRAPH EVIDENCE AT TRIAL

The polygraph has faced a difficult hurdle since its rejection in *Frye*. In 1923, *Frye* set the standard for scientific testimony for seventy years, but "[f]or the next fifty years nearly every court, state and federal, followed *Frye* not only by applying its test but also by using the test to exclude polygraph evidence when it was offered at trial."[78] Courts still typically reject polygraph testimony at trial unless its admissibility is stipulated by

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71. *Id.*

72. Ben-Shakhar & Elaad, *supra* note 63, at 132.

73. *Id.*; *see also* Vance V. MacLaren, *A Quantitative Review of the Guilty Knowledge Test*, 86 J. OF APPLIED PSYCHOL., 674, 679 (2001) (detailing studies of the GKT).

74. Ben-Shakhar et al., *supra* note 67, at 537.

75. Iacono & Lykken, *supra* note 36, § 40:107; *see also id.* § 40:48 (noting that the CQT depends on the disclosure of control questions so that subjects may answer deceptively).

76. *Id.*

77. Ben-Shakhar & Elaad, *supra* note 63, at 94.

78. Ric Simmons, *Conquering the Province of the Jury: Expert Testimony and the Professionalization of Fact-Finding*, 74 U. CIN. L. REV. 1013, 1039–40 (2006).

the parties.[79] "[S]tate and federal courts continue to express doubt about whether such evidence is reliable."[80] A few states bar any use of polygraph testimony, even where stipulated.[81] One Oregon case, *State v. Brown*, closely examined polygraph evidence after *Daubert*.[82] Later, the same court used the *Brown* analysis in *State v. Lyon* to bar even stipulated testimony.[83] The court interestingly found in both *Brown* and *Lyon* that the polygraph may meet most of the criteria for acceptance, but still held this evidence would not be admissible.[84] However, after *Daubert*, many courts have been willing to consider polygraph evidence admissible if stipulated,[85] and "[s]tipulations are customarily executed before administration of an examination."[86]

When considering the admissibility, perhaps the most important, yet often overlooked, assertion, was stated in *Brown*:

> There are several different types of polygraphic examinations, each based on different assumptions and each possessed of different degrees of accuracy. If the question is asked, "Should the results of polygraph examinations be admissible as evidence?," the response should not be an answer, but another question: "What type of polygraphic examination produced the results?"[87]

V. CQT AND GKT—PERVERSE TREATMENT UNDER *DAUBERT*

A. *Why Do Americans Love the CQT?*

Interestingly, in the United States, the term "polygraph" tends to mean the CQT method,[88] whereas in the global scientific community, the term "polygraph" means a tool used to detect guilty knowledge or deceit.

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79. 42 AM. JUR. TRIALS § 17, at 342 (1991 & Supp. 2005).

80. United States v. Scheffer, 523 U.S. 303, 312 (1998).

81. *See, e.g.*, Boling v. Boling, 887 S.W.2d 437, 441 (Mo. Ct. App. 1994) (holding polygraph testimony not admissible in civil cases, regardless of stipulation).

82. State v. Brown, 687 P.2d 751, 769 (Or. 1984).

83. State v. Lyon, 744 P.2d 231, 236–37 (Or. 1987).

84. *Id.*

85. United States v. Crumby, 895 F. Supp. 1354, 1356 (D. Ariz. 1995) (noting stipulation as the prevailing approach in circuit courts).

86. 42 AM. JUR. TRIALS § 17, at 344 (1991 & Supp. 2005).

87. *Brown*, 687 P.2d at 762.

88. *See* Ben-Shakhar et al., *supra* note 67, at 528 (discussing the absence of legal objections to the GKT presented to the courts).

That tool comes in a number of different forms, and some forms are better than others. Once familiar with the various techniques, a closer look at jurisprudential doctrine reveals that the controversy centers around the use of the CQT, which many scholars agree is unreliable.[89] "Unfortunately too little attention has been paid to research and discussions of other methods of psychophysiological detection. In particular . . . to the Guilty Knowledge Test . . . ."[90] "It is primarily because PDD [psychophysiological detection of deception] is an emotion-based assessment that it is not possible to use laboratory studies to gauge accuracy because real life emotion cannot be reproduced adequately in laboratory simulations."[91] The GKT differs from the CQT in that the cognition-based GKT is generally accepted within the relevant scientific community as being based upon "solid scientific principles and on proper control questions."[92]

There are few polygraphy experts with whom the American legal community is familiar; it seems the scientific research remains quite separate from the legal research. Professors Honts, Raskin, Kircher, Iacono, and Lykken—U.S. polygraphy experts frequently cited among legal academics—authored opposing views in a treatise on scientific evidence.[93] Honts, Raskin, and Kircher attempt to bolster the reliability of the CQT.[94] However, it appears the scientific community regards proponents of the CQT as a minority position.[95] Iacono and Lykken present compelling arguments that the CQT is not reliable: the

89. *See* GERSHON BEN-SHAKHAR, *A Critical Review of the Control Question Test (CQT)*, *in* HANDBOOK OF POLYGRAPH TESTING 105 (Murray Kleiner ed., 2002); Fiedler et al., *supra* note 34, at 313 (drawing on information Fiedler presented to the German Supreme Court that ultimately led to the federal system's ban of the CQT from legal procedures in the country, which had been the most extensively used form of polygraph).

90. Ben-Shakhar & Elaad, *supra* note 63, at 87.

91. Iacono & Lykken, *supra* note 36, § 40:106.

92. Ben-Shakhar & Elaad, *supra* note 59, at 132; *see also* David Carmel et al., *Estimating the Validity of the Guilty Knowledge Test from Simulated Experiments: The External Validity of Mock Crime Studies*, 9 J. EXPERIMENTAL PSYCHOL.: APPLIED 261, 261 (2003) ("[T]here is a general consensus that the GKT relies on proper control questions. . . .").

93. Honts et al., *supra* note 41, § 40:20 ("Scientific opinion about the validity of polygraph techniques is extremely polarized [and] the editors [of *Modern Scientific Evidence*] invited scientists from the 'two camps' on this issue to present their views.").

94. *Id.*

95. *See* Saxe & Ben-Shakhar, *supra* note 22, at 206 ("There is, however, in the voluminous literature on the validity of CQT-polygraph tests a strongly held minority position on the issue of whether such tests are valid to assess truthfulness or deception.").

questioning and administration of the CQT is not standardized,[96] interpreting results requires a great deal of subjectivity,[97] there are no controlling standards,[98] there is unknown reliability,[99] and it is based on an implausible theory.[100] Experts have demonstrated the CQT's limited evidentiary value and have argued the CQT fails to pass the *Daubert* standard.[101] In addition, Iacono and Lykken point out flaws in the studies purporting to support the CQT application,[102] concluding that innocent CQT takers have about a fifty percent chance of being deemed honest by a CQT administered in an adversarial manner.[103]

> The burden of proof remains on the advocates of the control question polygraph technique to demonstrate empirically that a method based on such implausible assumptions can have useful accuracy. That proof has not appeared and what relevant data are available . . . indicate

96. Honts et al., *supra* note 41, § 40:67 (examiners vary in their application of the CQT due to developing questions which require a "series of subjective assessments" which trick the subject about the purpose of the control questions).

97. *Id.* § 40:68 (noting that chart interpreters do not follow a uniform method).

> [I]nvestigators found that the examiners often ignored their own numerical scoring when interpreting charts. For instance, when the numerical scoring indicated deception, 18% of the time examiners concluded the test outcome was either inconclusive or truthful. When the scoring fell in the inconclusive range, the examiners actually classified subjects as guilty or truthful 49% of the time.

Id.

98. *Id.* § 40:69 (noting that there is not a standard exam, and thus, there cannot be a controlling standard).

99. *Id.* § 40:70 (pointing out that simply because examiners come up with reasonably consistent numerical scores does not mean the method is reliable or that examiners have been any less affected by the facts of the case). The professors also point out test-retest agreement is not valuable when the second tester knows the results of the first test, but that framework represents the typical confirmation process. *Id.* § 40:71.

100. *Id.* § 40:71 (explaining the CQT is based on a number of assumptions that are scientifically incorrect).

101. David Gallai, *Polygraph Evidence in Federal Courts: Should It Be Admissible?*, 36 AM. CRIM. L. REV. 87, 100–02 (1999).

102. Honts et al., *supra* note 41, §§ 40:91–40:92 (noting the problems with the existing lab and field studies). The authors also provide an example of a validity study conducted by Raskin, Kircher, Honts, and Horowitz and illustrate biases in the way the results were reported. *Id.* § 40:90. For example, they broke down the numbers and explained further problems when corroboration is dependent upon confessions. *Id.*

103. *Id.* § 40:93.

> clearly that the accuracy of the CQT is too low for it to qualify as a courtroom aid.[104]

Though many examiners are willing to claim near-perfect accuracy, Iacono and Lykken conducted "new and more extensive surveys of SPR [Society for Psychophysiological Research] members and also of general psychologists" that indicated 64% of the SPR members and 70% of the distinguished psychologists believed CQT was not scientifically sound. Approximately two-thirds of the SPR members and slightly more psychologists surveyed would want neither passed nor failed CQT results introduced as evidence in courts, and nearly all SPR respondents and seventy-five percent of the psychologists believed the CQT could be beaten.[105] Interestingly, the authors point out that David Raskin testified in *United States v. Clayton* "that an experienced examiner could be expected to identify correctly 'about 95% of the deceptive' and 'about 90% of the truthful people.'"[106] However, responses to the survey indicated "[o]nly about 25% agree that the CQT is accurate as often as 85% of the time."[107] Even agencies that use the CQT have indicated the results still should not come in the court; ultimately, it appears the government and investigators tend to use these relatively unreliable tools merely to gain confessions.[108]

It may at first glance appear the United States Supreme Court was correct in noting "the scientific community remains extremely polarized about the reliability of polygraph techniques."[109] However, this seeming split between these five scholars in the limited legal sources existing in the United States is not truly representative.[110] Ultimately, venturing outside the realm of the law library, one finds the authority typically tapped by attorneys is quite distinct from the authority provided by social scientists. Upon examining psychological and scientific journals, it appears globally, the CQT is generally rejected and the GKT is seen as having more

104. *Id.*

105. *Id.* § 40:102 & tbl.III; § 40:103 & tbl.IV.

106. *Id.* § 40:102 (quoting trial transcript of direct examination of David Raskin, United States v. Clayton, U.S. District Court, Phoenix, Arizona, Mar. 22, 1994, No. 92-374-PCT-RCB, at 109).

107. *Id*.

108. *E.g.*, Dan Eggen & Shankar Vendantam, *Polygraph Results Often Questioned*, WASH. POST, May 1, 2006, at A1.

109. United States v. Scheffer, 523 U.S. 303, 309 (1998) (citations omitted).

110. *See* discussion *infra* Part V.C.

promise.[111] Interestingly, the CQT seems to be a primarily North American fetish,[112] and though the GKT "has drawn considerable attention among researchers"[113] only Japan and Israel extensively use the GKT in criminal investigations.[114]

B. *GKT Ignored by Court Analyses*

Courts brush aside the GKT when analyzing potential polygraph evidence, and by failing to differentiate among the available methods, courts are perpetuating a misunderstanding that is ultimately leading to sound techniques being barred while shoddy techniques continue to appear in court via stipulation.

> Although [the GKT is] a better candidate for being admissible evidence, most debates and discussions of polygraphy have focused exclusively on the CQT, or lumped the two techniques together. Thus, the familiar and well-conceived legal objections to the CQT were generalized to the GKT, and GKT results, like those of the CQT, have not been presented in court.[115]

For example, as of January 14, 2007, a search in Westlaw's "All Federal & State Cases" database retrieves only six cases mentioning "guilty knowledge test," with most only mentioning it in a footnote, and a similar search for "concealed information test" (as the GKT is sometimes called) retrieved only one additional case. Too little crossover occurs between legal practitioners and social scientists.

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111. *See generally* Ben-Shakhar & Elaad, *supra* note 59, at 147 (Hebrew University of Jerusalem and The College of Judea and Samaria; published in American psychological journals; supportive of GKT); Fiedler et al., *supra* note 34, at 313, 323 (Fiedler provided the German Supreme Court with a report that led to the CQT being barred in German legal procedures); Vance V. MacLaren, *A Quantitative Review of the Guilty Knowledge Test*, 86 J. APPLIED PSYCHOL., 674, 679 (2001) (University of New Brunswick, Canada; voicing support for the GKT); Reiko Suzuki et al., *Specific and Reactive Sensitivities of Skin Resistance Response and Respiratory Apnea in a Japanese Concealed Information Test (CIT) of Criminal Guilt*, 36 CANADIAN J. BEHAVIOURAL SCI. 202 (2004) (authors are from Canada and Japan; expressing criticism of the CQT and offering research to further the application of GKT by incorporating the newly introduced respiratory-apnea response).

112. *See, e.g.*, Carmel, *supra* note 92, at 261 (noting that the CQT "is widely used in criminal investigations" in the United States, Canada, and Israel).

113. Ben-Shakhar & Elaad, *supra* note 59, at 132.

114. Iacono & Lykken, *supra* note 36, § 40:45.

115. Ben-Shakhar et al., *supra* note 67, at 528 (citation omitted).

1. *A Look at* State v. Brown[116]

The Oregon Supreme Court appears to be the only court that has conducted a full analysis of the GKT in its decision in *State v. Brown*, a case more than twenty years old.[117] The Oregon Supreme Court later drew upon its *Brown* analysis in *State v. Lyon*, when the court ultimately decided to bar all polygraph evidence, even that whose admission is stipulated.[118] So, the analysis in *Brown* and *Lyon* continues to live on as these cases are cited time and again, despite a number of outdated statements in the original polygraph analysis set forth in *Brown*.

The court in *Brown* noted "the term 'accuracy of polygraphy' is ambiguous" when researchers noted a number of problems with the polygraph, but failed to "distinguish which type of polygraph test [wa]s being evaluated [or] distinguish between reliability and validity"; the experts cited authority without "reference to the type of test or the basis for the determination of accuracy."[119] This court should be applauded for identifying this deficiency, as it is certainly among the minority of courts that have recognized and commented upon it.[120]

However, in *Brown*, the court failed to clearly delineate the contours of its analysis in examining what seemed to be described as a GKT, but was labeled a peak of tension test.[121] The court considered arguments and debate that really only applied to a CQT when it banned introduction of polygraph evidence. The court continually cited Lykken as the chief critic of polygraphs and referenced Lykken's 1981 book, which pointed to the many defects of the polygraph forms preceding the GKT.[122] Lykken is certainly well known as a critic of the CQT and other attempts to measure

116. State v. Brown, 687 P.2d 751 (Or. 1984).

117. *Id.* at 763–64 (expert testimony describing the test format). There is an additional form of the peak of tension test called the searching peak of tension test in which the examiner does not have information about details of the crime but lists possible answers and measures the response. People v. Page, 2 Cal. Rptr. 2d 898, 904 (Ct. App. 1991).

118. State v. Lyon, 744 P.2d 231, 236–38 (Or. 1987).

119. *Brown*, 687 P.2d at 767.

120. A Westlaw search revealed fewer than five cases that even mention a difference, and in those that do mention a distinction between the two types of tests, a flawed analysis typically follows, or flaws of the CQT are improperly attributed to the GKT.

121. *Brown*, 687 P.2d at 763.

122. *Id.* at 762, 763, 767–71. *See generally* DAVID THORESON LYKKEN, A TREMOR IN THE BLOOD (1981).

deception directly; however, he powerfully advocated use GKT.[123] The court indicated Lykken was "critical of *all* polygraph tests and results."[124] This statement was simply wrong: Lykken *does* believe the GKT has merit.[125] In the very book to which the *Brown* court cited, Lykken called the GKT "to some extent [his] own brainchild."[126] Lykken was renowned for his work "to debunk the use of polygraph tests in court . . . traveling around the country, testifying about the machines' flawed science before Congress and at countless trials."[127] However, it was also Lykken who "devised a Guilty Knowledge Test that cleared innocent subjects and identified guilty people by studying physiological reactions to multiple-choice questions whose answers only the guilty party would know."[128]

The court conducted a confusing analysis of polygraph literature and testimony. It seemed to accept that "'[a] statistical determination of the accuracy of the Polygraph technique is practically impossible.'"[129] The court asserted that when Dr. Stanley Abrams "testified that polygraph testing is 98 percent accurate, he cited no studies directed specifically to the peak of tension test to back up his estimate."[130] The court pointed to a statement in Lykken's book indicating Lykken believed there was no data analyzing the validity of the peak of tension test.[131] This seems a curious statement because the court also cited Dr. Abrams' 1977 treatise, which illustrated Lykken's agreement that peak of tension test reliability remains "extremely high."[132]

The court failed to recognize Lykken's advocacy of the GKT, and

123. *See* LYKKEN, *supra* note 122, at 297. In the very book to which the *Brown* court cited, Lykken called the GKT "to some extent [his] own brainchild." *Id.*; s*ee also* Iacono & Lykken, *supra* note 36, §§ 40:104–40:105 (after blasting the CQT, Lykken was cited again as "believ[ing] that the GKT, in contrast, is scientifically credible").

124. *Brown*, 687 P.2d at 763 (emphasis added).

125. J.P. Rosenfeld, *Alternative Views of Bashore and Rapp's (1993) Alternatives to Traditional Polygraphy: A Critique*, 117(1) PSYCHOL. BULL. 159, 160 (1995).

126. LYKKEN, *supra* note 122, at 297.

127. Curt Brown, *David Lykken, U of M Psychology Professor: He Helped to Debunk the Use of Polygraph Tests in Court and Show the Inherited Traits of Twins Raised Apart*, STAR. TRIB., Sept. 13, 2006, at 8B.

128. *Id.*

129. State v. Brown, 687 P.2d 751, 766 (Or. 1984) (quoting REID & INBAU, TRUTH AND DECEPTION 28 (2d ed. 1977)).

130. *Id*. at 769.

131. *Id.* at 763.

132. *Id.* (citing STANLEY ABRAMS, A POLYGRAPH HANDBOOK FOR ATTORNEYS 72 (1977)).

likewise failed to distinguish the GKT from the particular test examined in *Brown*. Thus, the opinion may have mislabeled the analyses involved, contributing to its confusion. The court likely extrapolated from Lykken's criticism of the CQT (and other GKT predecessors) to incorrectly suggest Lykken would have doubted the validity of what seemed to be a GKT.

Indeed, Lykken stated "studies of the GKT are clear in demonstrating that this is a highly accurate technique for determining if an individual recognizes information."[133] Lykken always maintained that the problem he had with polygraphy was with psychophysiological detection of deception attempting to measure emotions. In contrast, the GKT allows a measurement of "cognitive processing associated with memory, something that *can* be determined using psychophysiological procedures."[134] It was Lykken in 1974 who first realized the potential to use orienting responses to measure guilty knowledge.[135] Thus, the *Brown* court was correct that the particular method must be known to understand the value of a given polygraph test. However, the court in *Brown* failed to note Lykken's support of the GKT, and in *Lyon* failed to revisit the distinctions among polygraph forms.[136] It was Lykken who wrote, "studies *can* be used to show how well certain memories can be detected because the assessment of memory in the laboratory does not differ in any important way from the assessment of memory in the field."[137] Other critics of the CQT method have agreed that the GKT does allow for testability, known error rates, peer review and publication, and general acceptance in the scientific community—all considerations of *Daubert*.[138]

There are legitimate concerns when considering a GKT, but those concerns typically involve leakage of information and the way in which the examiner conducts the test.[139] However, courts dwell on the CQT's lack of reliability, lack of established error rates, and debates among psychophysiologists about the CQT's effectiveness, and these CQT problems are improperly transferred to the GKT as well.[140] It is true the GKT does take more time to prepare and requires identifying and keeping confidential salient features from the crime, making the GKT not easily

133. Iacono & Lykken, *supra* note 36, § 40:109.
134. *Id.* § 40:106 (emphasis added).
135. Ben-Shakhar & Elaad, *supra* note 59, at 132.
136. State v. Lyon, 744 P.2d 231, 236–38 (Or. 1987).
137. Iacono & Lykken, *supra* note 36, § 40:106 (emphasis added).
138. Ben-Shakhar et al., *supra* note 67, at 528, 534–35.
139. *Id.* at 535.
140. *Id.* at 528.

administered.[141] Although this may partially reveal the reason the GKT is not widely used in the United States, there are compelling arguments that modifications in the way polygraphs are conducted in America would greatly benefit the criminal justice system, and "such efforts w[ould] be fruitful because . . . the GKT has excellent potential as a forensic application of psychophysiology."[142]

The *Brown* court acknowledged the argument that the GKT peak of tension test "persists as a reliable indicator of deception" and should be the preferred test when circumstances allow.[143] Presumably, circumstances would allow when critical information has not been leaked. Simple changes in the way investigations are conducted would lead to less information spilling into the ears of innocent suspects.[144]

2. *A Look at* United States v. Scheffer[145]

In the United States Supreme Court's most recent detailed examination of polygraphs, *United States v. Scheffer*, the Court held polygraph results from a defendant airman's test could be flatly barred under the Military Rule of Evidence 707, which does not allow polygraph evidence in court-martial proceedings.[146] The test conducted in *Scheffer* was a CQT, although that fact is not entirely apparent in the Court ruling.[147] Justice Thomas explained the procedure as follows:

> The common form of polygraph test measures a variety of physiological responses to a set of questions asked by the examiner, who then interprets these physiological correlates of anxiety and offers an opinion to the jury about whether the witness—often, as in this

141. Ben-Shakhar & Elaad, *supra* note 59, at 147.

142. Ben-Shakhar & Elaad, *supra* note 63, at 98.

143. State v. Brown, 687 P.2d 751, 764 (Or. 1984) (citing REID & INBAU, TRUTH AND DECEPTION 55 (2d ed. 1977)).

144. Ben-Shakhar & Elaad, *supra* note 63, at 96.

145. United States v. Scheffer, 523 U.S. 303 (1998).

146. *Id.* at 317.

147. *See* Brief for National Association of Criminal Defense Lawyers as Amicus Curiae Supporting Respondent, United States v. Scheffer, 523 U.S. 303 (1998) (No. 96-1133), 1997 WL 436149 (using what amicus called a "specific-issue control question polygraph"). One may surmise that because the Court cites Iacono and Lykken in that the "'control question technique' polygraph is 'little better than could be obtained by the toss of a coin,'" that the Court was addressing the CQT. *Scheffer*, 523 U.S. at 310. However, absent any mention of another polygraph technique, most who read the opinion would neither notice the polygraph was referred to as a "control question technique," nor infer there is apparently more than one technique.

> case, the accused—was deceptive in answering questions about the very matters at issue in the trial.[148]

This explanation fails to establish that "the common form" means the CQT, one of several polygraph techniques. "Physiological correlates of anxiety" are implicated only in regard to the RIT or the CQT—but anyone reading this opinion would have to first research psychological journals to know that, or to know the GKT and its predecessors use a method not dependent on feelings of anxiety. Additionally, opining the introduction of polygraph evidence would "entail assessments of such issues as whether the test and control questions were appropriate"[149] seems to indicate further the Court's explanation is ill-informed. As discussed, the CQT does not involve questions that are "true 'control' questions in the scientific sense."[150] Offering expert testimony regarding the control questions in a particular case would be relatively futile because the "questions do not predict how this subject should respond to the relevant questions if he is answering truthfully."[151]

By failing to correctly establish the underpinnings of the CQT, the Court referred generically to polygraph evidence as being inadmissible under Military Rule of Evidence 707, saying the exclusion was justified because it furthered the interests of "ensuring that only reliable evidence is introduced at trial, preserving the court members' role in determining credibility, and avoiding litigation that is collateral to the primary purpose of the trial."[152] By failing to distinguish among the various techniques in existence, the Court perpetuated misunderstandings regarding the technologies. The Court cited the work of Iacono and Lykken, who represent the polygraph critics.[153] However, the Court failed to mention that although these well known psychology professors did effectively and comprehensively discredit the CQT, Iacano and Lykken also noted within the very treatise cited by the majority that "the GKT [Guilty Knowledge Test], in contrast, *is* scientifically credible."[154] Had the Court distinguished between the CQT and the GKT in its ruling, the Court could have potentially preserved the ability for a party to use the more scientifically reliable GKT results in a military court. Instead, the Court erected a

148. *Scheffer*, 523 U.S. at 313.
149. *Id.* at 314.
150. Askins, *supra* note 30, at 181.
151. Iacono & Lykken, *supra* note 36, § 40:73.
152. *Scheffer*, 523 U.S. at 309.
153. *Id.* at 310.
154. Iacono & Lykken, *supra* note 36, § 40:105 (emphasis added).

virtual bar against evidence otherwise meeting the articulated interests the Court was seeking to serve. The Court, perhaps unconsciously, discredited the GKT by presumably lumping it into the same generic "polygraph" category as the CQT.[155] Further, the Court sets precedent legal practitioners across the nation will cite and look to for guidance. These practitioners, however, will not find a helpful discussion regarding the various forms of polygraph available or an explanation that various forms even exist.

C. *The Only Remaining Problem with the GKT*

As noted, being unable to measure validity and reliability are problems only involved in the CQT, because the GKT allows for testability in these areas.[156] The GKT yields fewer false-positives than the CQT.[157] False-negatives do exist in the GKT application, but with each additional GKT question used in the test, the errors are greatly reduced.[158] Studies suggesting low error rates have been criticized because the laboratory settings may not allow for a realistic understanding of what a criminal will recall.[159] A critic of the GKT, Dr. J.P. Rosenfeld, argues regardless of "sound conceptual and empirical foundation of the GKT," low detection rates have been reported in a number of studies.[160] Some critics may be willing to argue a lack of field studies indicates the GKT will not be useful in a real-life setting. However, memory studies can help establish which kinds of questions and presentations assist a more reliable GKT examination. For instance, studies have indicated certain parts of a crime are more salient to the criminal than to an eyewitness.[161] A review of studies reporting higher levels of false-negatives revealed that where false-negatives were high, the questions typically dealt with "peripheral" details as opposed to "central" details of the crime scene.[162] The ability to recall certain kinds of details can certainly be studied in more depth. Differentiating between the cues that are more memorable to the

155. *See generally* Ben-Shakhar et al., *supra* note 67.

156. *See id.* at 103 (listing the problems of the CQT).

157. *See supra* Part V.A–B (discussing the CQT and the GKT).

158. *See* Ben-Shakhar et al., *supra* note 67, at 534–35. False-negatives ranged between 16% and 19%, and were reduced to 13% with additional GKT questions. *Id.* This does pose problems for field application where publicity may reduce the number of available details not disclosed to the public.

159. *See* Carmel, *supra* note 92, at 262; Rosenfeld, *supra* note 125, at 161.

160. Rosenfeld, *supra* note 125, at 161.

161. Carmel, *supra* note 92, at 266.

162. *Id.*

perpetrator of a crime (eliminating peripheral questions or adding central questions) resulted in greatly increased reliability ratings of the test.[163] This poses the very real challenge of finding a sufficient number of details that are not only relevant, but unknown to the innocent suspects.[164] Acknowledging such a challenge, however, does not render a *properly administered* (using relevant, unknown details) GKT less reliable.

The potential use of countermeasures poses the larger problem facing the traditional form of the GKT. Effective countermeasures increase false-negatives (but not false-positives), thus affecting reliability ratings of the GKT.[165] Countermeasures are also effective in the CQT,[166] but even without countermeasures, the CQT provides flawed readings because the measured emotional responses are not limited to deception.[167] Thus, significant inaccuracies in the CQT exist with or without countermeasures and include both false-positives and false-negatives.[168]

1. *Potential Solution for the Problem of Countermeasures Employed in the GKT*

Though countermeasures may be effective in defeating the traditional GKT, it has been suggested a "possible approach for dealing with countermeasure manipulations is the use of GKTs that are based on event-related potentials (ERPs) instead of autonomic measures."[169] Indeed, those critical of the CQT acknowledge the GKT remains viable, and further, those authors have indicated the ERP-GKT (frequently called "Brain Fingerprinting" in the media, the trade name of one inventor's technology) offers a number of advantages over the already established GKT:

> Because ERPs are derived from brain signals that occur only a few

163. *Id.* at 267. The authors acknowledged examiners may use more peripheral cues when it is difficult to find details the suspect has not been exposed to through conversations or the media.

164. *See* Lawrence A. Farwell & Sharon S. Smith, *Using Brain MERMER Testing to Detect Knowledge Despite Efforts to Conceal*, 46 J. FORENSIC SCI. 135, 137 (2001).

165. Ben-Shakhar & Elaad, *supra* note 59, at 146; *see also* Ben-Shakhar et al., *supra* note 67, at 532.

166. Ben-Shakhar et al., *supra* note 67, at 532.

167. *See supra* notes 61–62 and accompanying text (indicating false-positives and false-negatives occur because the CQT relies on emotion-based responses).

168. *See* MCCORMICK ON EVIDENCE, *supra* note 30.

169. Ben-Shakhar & Elaad, *supra* note 63, at 96–97.

> hundred milliseconds after the GKT alternatives are presented, and because as yet no one has shown that humans can selectively alter these brain potentials at will, it is unlikely that countermeasures could be used successfully to defeat a GKT derived from the recording of cerebral signals.[170]

Thus, scientists who have studied psychophysiological deception generally agree that whereas the CQT has debatable reliability, the GKT seems to pass *Daubert* standards.[171] An ERP–GKT offers an even stronger scientific backbone.[172] In addition, even though countermeasures may impact outcomes in the traditional GKT, applying the GKT as an ERP-GKT should make countermeasures less effective.[173]

VI. TAKING THE GKT ONE STEP FURTHER: P300-GKT AND BRAIN FINGERPRINTING

Dr. Lawrence A. Farwell coined the term "Brain Fingerprinting" to refer to "a process of detecting instrumentally whether certain information is stored in [someone's] brain."[174] In the process of any act—in particular, committing a crime—information about the act and its context is collected and stored in the perpetrator's brain.[175] Brain Fingerprinting scientifically exposes whether a suspect has knowledge relating to a particular crime by measuring certain involuntary, physiological responses to stimuli;[176] it does essentially the same thing as the conventional GKT, but uses ERPs rather than some other measure, such as galvanic skin responses.[177]

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170. Iacono & Lykken, *supra* note 36, § 40:108.

171. *See* Ben-Shakhar et al., *supra* note 67, at 535. For example, if a particular GKT application seems suspect, it can be presented to a jury because deficiencies can be explained to a jury more easily because the GKT employs testable standards.

172. *See infra* Part VI.

173. *See* Ben-Shakhar & Elaad, *supra* note 59, at 146; *see also* Honts *supra* note 102 and accompanying text.

174. Andre A. Moenssens, *Brain Fingerprinting—Can It Be Used to Detect the Innocence of Persons Charged with a Crime?*, 70 UMKC L. REV. 891, 891 (2002).

175. *Id.*

176. *Id.* at 893; *see also* Brain Fingerprinting Laboratories, *A New Paradigm in Criminal Justice*, http://www.brainwavescience.com/criminal-justice.php (last visited May 9, 2007) (Farwell's website explains the technique); Brain Fingerprinting Laboratories, *Research and Summary Information*, http://www.brainwavescience.com/research.php (last visited May 9, 2007) (providing more details of the science and offering a link to Dr. Farwell's publications on topic).

177. Iacono & Lykken, *supra* note 36, § 40:108.

> An ERP is a brainwave generated every time a person is presented with a discrete stimulus. This complex wave has multiple components, but one aspect of the signal, called the P300 . . . wave (because it has a latency of over 300 milliseconds . . .), is especially useful for assessing recognition memory.[178]

A P300 is produced any time something "stands out" as distinct from other stimuli presented to someone.[179] Therefore, when an examiner presents a guilty individual with information about the crime, it is recognized, and a P300 wave will result. "For the innocent person, none of the alternatives has distinct meaning, so none will evoke a P300 wave."[180] Farwell is not the only psychophysiologist to study this effect, but he patented his specific Brain Fingerprinting technique and markets it to the legal world.[181]

Farwell first wrote about this brand of cognitive psychophysiology in 1986 as a graduate student,[182] but the study of electrical impulses released from the brain was studied as early as 1875.[183] The P300 effect itself, upon which Brain Fingerprinting is based, has been researched since 1965.[184] The P300 is an involuntary response from one's brain measured by placing an electrode headband on the subject providing an EEG reading.[185]

Farwell explains brain neurons fire electrically and in specific patterns, and the electrical signals can be detected and recorded.[186] People

178. *Id.*

179. *Id.*

180. *Id.*

181. *See, e.g.*, Brain Fingerprinting, http://www.brainwavescience.com (last visited May 9, 2007).

182. Moenssens, *supra* note 174, at 891 n.1.

183. *Id.* at 893.

184. *Id.* at 893–94 ("The specific involuntarily emitted brain wave pattern that Dr. Farwell initially used was the P300, discovered in 1965 by Dr. Samuel Sutton and his collaborators.") (footnote omitted).

185. *Id.* at 896. Responses are averaged together, but "the ERP [remains] 'time-locked' to the stimulus (i.e., its shape and latency is [sic] the same to every stimulus presentation beginning the moment the stimulus is presented), averaging [thus] enhances the ERP signal." Iacono & Lykken, *supra* note 36, § 40:108. The infinitesimal response is strengthened by the averaging, and the "background electrical activity . . . fade[s] away." *Id.* Therefore, computers are used to present the stimuli, which must be repeatedly presented with exact timing for a very brief period (about fifty milliseconds). *Id.* However, computer-aided presentation poses no serious problems, because such a short presentation allows for hundreds of stimuli presentations in a matter of minutes. *Id.*

186. *Innovation Series*: *Brain Fingerprinting* (PBS television broadcast May 4,

"don't have a choice about making these particular responses. When something significant comes up that [they] notice, the brain [will] say, . . . 'Aha! Yeah, that's something important to me.'"[187] This immediate response of recognition is the P300 effect. Farwell bases his work on this effect, and uses it to make a determination about whether a suspect's brain is familiar with the data.[188]

While the subject wears an electrode headband, he watches a computer screen displaying certain words or pictures that are either "'target' stimuli (details of an activity . . . known to the subject), irrelevant stimuli (which would not be expected to elicit a response), and 'probe' stimuli (phrases or pictures supposedly known only to a select few, like the perpetrator . . . of a crime)."[189]

Farwell himself makes the target stimuli relevant to the subject to provide a control (to get a "picture" of an individual's P300), and to ensure the subject pays attention to the test.[190] For example, if testing knowledge of a weapon used in a crime, assume:

> [t]he examiner and the person being tested agree that the item used was not a gun. The actual crime weapon was a hammer. These words, *gun* (the target) and *hammer* (the probe) are flashed every two seconds or so on a computer screen, randomly interspersed with the irrelevant words *knife, rope,* and *poison.* The subject is told to press a red response key every time *gun* appears on the screen and a green response key every time another word is presented. This manual response requirement forces the person to pay attention because it compels cognitive processing of each word in order to be able to press the correct key. Because the word *gun* stands out as memorable, when the ERPs to this word are averaged, a distinct P300 wave will be seen. *Knife, rope* and *poison* have no special meaning, so ERPs averaged to these words will not contain a distinct P300 wave.[191]

Therefore, the pertinent concern is whether the probe word (e.g., hammer), results in a P300 that looks like the wave produced by the target (e.g., gun), or if it more closely resembles the irrelevants (e.g., knife, rope,

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2004), *transcript available at* http://www.pbs.org/wnet/innovation/transcript_episode8.html (last visited May 9, 2007).

187. *Id.*

188. *Id.*; *see also* Moenssens, *supra* note 174, at 896–97 (2002) (explaining Farwell's examination process).

189. Sara Solovitch, *Mind Reader*, LEGAL AFFAIRS, Nov.–Dec. 2002, at 66.

190. *See* Iacono & Lykken, *supra* note 36, § 40:108.

191. *Id*. (emphasis added).

or poison).[192] If the waves of the target and probe are similar, one can infer the subject has guilty knowledge.[193]

Farwell discovered an offshoot of the P300 effect that lasts from about 300 to 800 milliseconds after a familiar stimulus.[194] He began to research what "was part of a larger complex of phenomena that continued to take place after the initial P300 stimulus had occurred."[195] From the discovery of this "extended response," Farwell has developed extensive research in what he calls the "MERMER effect,"[196] measuring these cognitive processes in addition to the P300.[197] Farwell claims "[t]he discovery of the MERMER allows the results gained through the P300 testing to be even more accurate."[198] However, Farwell's application of the science through his MERMER methodology is not as well known among psychophysiologists as the P300, and thus, its reliability will likely be questioned in the courtroom until a more general consensus is established.[199] But while skeptics of scientific evidence may have qualms with Farwell's more specific MERMER effect as failing the general acceptance test, "the existence and nature of the P300 wave has been known by science generally for decades and . . . scientists in the psychophysiology and neuroscience fields have generally accepted the conclusions about its function and meaning."[200] Simply because the MERMER technique has not yet been established as scientifically reliable, does not mean that it is, in fact, scientifically unreliable.[201] Additionally,

192. *Id.*

193. *Id.*

194. Moenssens, *supra* note 174, at 895 n.27.

195. *Id.* at 895.

196. "[M]emory and encoding related multifaceted electroencephalographic response." Farwell & Smith, *supra* note 164, at 135.

197. Moenssens, *supra* note 174, at 895. Note that a MERMER "always also includes the P300 (positive EEG spike) but in addition includes a study of the negative deflection (below the baseline continuation) of the wave that follows the P300." *Id*. at 895 n.27.

198. Brain Fingerprinting Laboratories, *A New Paradigm in Criminal Justice*, http://www.brainwavescience.com/criminal-justice.php (last visited May 9, 2007).

199. Moenssens, *supra* note 174, at 906.

200. *Id.*

201. *Cf.* Cavazos v. State, 779 P.2d 987, 989 (Okla. Crim. App. 1989) ("[T]he fact that the chemical process used by the forensic chemist was not proven to be accurate and accepted by the scientific community is not dispositive."); Moenssens, *supra* note 174, at 906 ("It is entirely possible—indeed probably likely—that as additional research continues . . . brain fingerprinting will be shown to be based on a validated methodology and rest on sound scientific knowledge.").

regardless of legal skeptics, the relevant scientific community will likely acknowledge and readily accept a technique such as MERMER—one improving an already established theory based on the known P300 effect. Dr. Iacono acknowledged in court that Farwell's model "was essentially an elaboration and extension of the 'guilty knowledge' test which is 'broadly embraced by knowledgeable scientists as a technique that is scientifically sound and that does provide valuable information to determine if people possess crime relevant memory,'" and that the technique Farwell used is accepted within the scientific community.[202]

A. *Brain Fingerprinting Framed Differently in Law than in Science*

Note Dr. Iacono's testimony in the preceding paragraph reveals Brain Fingerprinting *is* a form of polygraph—an extension of the GKT. Farwell goes to great lengths to keep his technology dissociated from polygraph, assuring the legal community Brain Fingerprinting is not a polygraph, but rather a "multiple choice test" for the brain.[203]

On the frequently asked questions section of Farwell's webpage, the question, "What other similar technologies are there now in use?" appears.[204] Farwell merely explains that matching stored information from one's mind with information from a crime is similar to fingerprinting or DNA analysis (where guilty evidence is compared to a database).[205] A more accurate answer would be to explain the GKT, a known form of polygraph among psychophysiologists. Additionally, Farwell flatly rejects his technology is a polygraph by stating that "Brain Fingerprinting technology and polygraphy have their foundations in totally separate fields of science."[206] Brain Fingerprinting is certainly distinct from other forms of polygraph, and while Farwell is likely correct that it is more reliable, it is really nothing more than a new and improved application of the GKT. Farwell recognizes that the polygraph, as it is known in the United States, measures emotional responses,[207] and polygraph evidence has been difficult

202. Moenssens, *supra* note 174, at 895 n.27. Iacono testified at Terry Harrington's hearing. *Id.*

203. *See id.* at 899 (noting that Farwell rejects comparison to the polygraph).

204. Brain Fingerprinting Laboratories, Interview with Dr. Lawrence Farwell: Frequently Asked Questions, http://www.brainwavescience.com/FreqAskedQuestions.php (last visited May 9, 2007).

205. *Id.*

206. *Id.*

207. Transcript of Proceedings at 143–44, Harrington v. State, No. PCCV 073245 (Iowa Dist. Ct. for Pottawattamie County 2001).

to introduce in court since its initial rejection in *Frye*.[208] Farwell testified in Harrington's trial that the word "polygraph" is deceiving: "polygraph simply means that you use a number of channels to acquire data, so technically everything in psychophysiology [is polygraphy]. But polygraph, when the word is specifically used for lie detection . . . [has come to mean a measurement of] a physiological response" arising from an emotional reaction during interrogation.[209] He explained,

> what a polygraph measures is . . . the kind of things that change under emotional situations . . . . That's fundamentally different from the question of information processing in the brain. Another fundamental difference is that we can clearly see the results in the graphs for the tests that I have done, but that's not the basis on which we make conclusions. It's not a subjective evaluation by myself or anyone else. It's a matter of mathematical algorythm [sic] that tells us [what] those brain responses mean . . . and gives us a statistical confidence for whether that . . . information is there or not.[210]

As opposed to any traditional form of polygraphy, the scientific component of Brain Fingerprinting remains distinct from the subjective elements. Brain Fingerprinting science and other forms of the ERP-GKT simply determine whether specific information is stored in the brain. The judge and jury interpret what the presence or absence of the information means, make inferences based on science, and decide how much weight to assign the experts' conclusions.[211] Farwell further explains that a traditional polygraph

> attempts to detect deception in response to probing questions . . . which could register changes for a variety of reasons other than because the subject is lying. Brain Fingerprinting testing, in contrast, allows an investigator to determine whether certain specific information is stored in an individual's brain—for example, the details of a crime known only to the perpetrator and investigators. Brain Fingerprinting testing works regardless of whether or not the subject is lying.[212]

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208. *See* Simmons, *supra* note 78, at 1039–40.

209. *Id.* at 143.

210. *Id.* at 143–44.

211. Lawrence A. Farwell, The Role of Brain Fingerprinting Science in Criminal Proceedings, White Paper Prepared for the Department of Defense Polygraph Institute (Oct. 13, 2005) (on file with author).

212. Brain Fingerprinting Laboratories, Frequently Asked Questions, *supra*

Farwell's explanation makes clear Brain Fingerprinting's relation to the GKT. The GKT advocates promote its use for the same reason: the GKT does *not* attempt to measure directly when someone is lying.

Farwell's attempts to reclassify Brain Fingerprinting as distinct from polygraph appear to have worked to a large extent within the legal community—although not necessarily within the psychophysiological community. For instance, the sole law review article focused on Brain Fingerprinting only tangentially refers to the GKT in a footnote, failing to provide any clear link between this known form of polygraphy and Brain Fingerprinting.[213] The author of the article simply states, "Dr. Farwell's sometimes indignant rejection of comparison with the polygraph may sound somewhat hollow."[214] However, given the legal world's limited understanding of polygraphy and courts' resistance to admit polygraph evidence at trial, Dr. Farwell essentially has no available alternative to distancing his technology from what is understood to be "the polygraph."[215]

Today's vernacular relegates the term "polygraph" to a constricted definition. Because legal academics narrowly define polygraphy, misconceptions about the various forms of technologies persist. First, relative similarities and differences of the conventional techniques should be fleshed out in legal periodicals, courtrooms, and case opinions. Specifically, distinctions between the CQT and the traditional GKT should have been clarified in the legal arena years ago. Had such a stage been set, Brain Fingerprinting may have been more easily introduced to and understood by courts as an elaboration of the GKT. Dr. Farwell lacks the advantage of being able to frame his technology in that manner because few legal practitioners even know of the GKT. Nor can legal practitioners fully appreciate Brain Fingerprinting's advantages over the conventional GKT without that basic understanding.

Because Farwell is limited in his ability to draw upon the research supporting the GKT when explaining his technology to the court, Farwell's work may be facing unnecessary hurdles. For instance, some may view his technology as a wholly novel, perhaps unbelievable, science.

Slaughter v. State provides an example of a court misinterpreting

note 204.

213. Moenssens, *supra* note 174, at 905 n.88.

214. *Id.* at 901.

215. *See id.* at 895 n.27 (stating brain fingerprinting has "a high degree of acceptance in the scientific community").

Brain Fingerprinting.[216] The Oklahoma Court of Criminal Appeals barred Brain Fingerprinting evidence on procedural grounds in Jimmie Ray Slaughter's post conviction appeal.[217] The court unnecessarily went on to express doubt that Brain Fingerprinting would survive *Daubert* considerations.[218] It is unfortunate Farwell faced this bar against presenting Brain Fingerprinting as an application of the GKT, or from framing his technology as an improvement upon an already recognized investigative tool that builds upon sound scientific principles. A review of the record, however, suggests the court sought first and foremost to uphold a death penalty. The court held exculpatory DNA evidence inadmissible,[219] ignored evidence of unfair prosecutorial strategies,[220] and disregarded Slaughter's alibi.[221] Thus, the *Slaughter* court may have discounted Brain Fingerprinting evidence regardless of its presentation.

B. *Brain Fingerprinting Evidence Allowed in Harrington Trial*

Brain Fingerprinting evidence has thus far been admitted in only one United States court, a post-conviction appeal in an Iowa state court.[222] The district court found "[t]he P-300 effect has been studied by psycho-physiologists . . . [and] has been recognized for nearly twenty years."[223] The judge also found the P300 response "has been subject to testing and peer review in the scientific community," and the court explained the relevant scientific community accepts the P300 as legitimate.[224] Although the court admitted Brain Fingerprinting evidence based upon the P300 effect, the court found Farwell's more specific MERMER technique had not yet been subject to sufficient examination within the scientific community—but the experts offered by both sides of the case seemed to indicate the MERMER effect could very well increase the reliability of the P300 effect.[225] The

216. Slaughter v. State, 105 P.3d 832 (Okla. Crim. App. 2005).

217. *Id.* at 836.

218. *Id.*; *see also* Comm. on Sci. & Law, *Are Your Thoughts Your Own?: "Neuroprivacy" and the Legal Implications of Brain Imaging*, 60 THE REC. OF THE ASS'N OF THE B. OF N.Y. 407, 410 (2005) (noting the court's skepticism in *Slaughter*).

219. *Slaughter*, 105 P.3d at 836.

220. *See* Petitioner's Second Notice to the Court Concerning DNA Testing, Slaughter v. State, 105 P.3d 832 (Okla. Crim. App. 2004) (No. PCD-2004-277).

221. *Id.*

222. Harrington v. State, No. PCCV 073247, Ruling (Iowa Dist. Ct. for Pottawattamie County 2001).

223. *Id.* at 5.

224. *Id.*

225. *Id.* at 9.

significance for Farwell, however, was that the court admitted Brain Fingerprinting evidence, albeit evidence based upon the P300 analysis and not Farwell's MERMER rendition.[226]

Though brain wave evidence was admitted in Harrington's case, the court concluded the results of the test were unlikely to change the result of Harrington's trial and criticized the probes used by Farwell.[227] Judge O'Grady focused on the subjectivity of choosing probe stimuli and opined that the probe stimuli were not significant enough to be meaningful because the phrases (such as "high weeds" and "parked cars") were too general to provide a reliable information-absent response.[228] As highlighted in his amicus brief, Dr. Farwell's attorney explained that such an analysis is flawed.[229] The relevance of the crime probes is that "Farwell clearly explain[s] [to the subject] the significance of each of the probes in a specific context, without telling [the subject] which stimulus was the actual probe containing the correct information about the crime."[230] For example, "weeds" and "ditch"

> were mentioned in the trial and therefore might have been known to Harringon. However, these words were not placed in their respective contexts at trial: the *test* presented both the "weeds and grass" probe and the "drainage ditch" probe in a context where the perpetrator was said to be impeded by or surmounting an obstacle as he ran to the getaway car. Simply because the words without a context were uttered in the trial record, the court should not have inferred that the probes were in some way tainted by exposure to Harrington at trial.[231]

Significantly, "Harrington's brain responses show[ed] that he did not

226. *Id.*

227. *Id.*

228. *Id.* at 10.

229. Brief for Dr. Lawrence A. Farwell as Amicus Curiae Supporting Appellant, Harrington v. State, 659 N.W.2d 509 (2002) (No. 01-0653) [hereinafter Harrington Brief].

230. *Id.* "[W]hen a person is presented with a stimulus that he fails to place in a memory context, his brain does not emit a P300." *Id.*

231. *Id.* (emphasis added). Harrington's conviction was ultimately vacated due to a *Brady* violation and the Iowa Supreme Court left untouched the issue of Brain Fingerprinting, but noted it had been admitted in the case below. Interestingly, the missing documents upon which the *Brady* violation was established were found as researchers were searching for probe stimuli to use in the Brain Fingerprinting test. Telephone interview with Thomas Makeig, Attorney for Dr. Lawrence Farwell, (Jan. 15, 2006).

recognize these specific probes as significant in their respective contexts."[232] A closer look at Farwell's testimony, which was unchallenged by experts on either side, reveals an information-absent response is essentially self-verifying in that the information literally was not in his brain.[233] One argument for this could be Harrington simply did not remember the details. Forgetting would lead to an information-absent response. However, the judge opined the test was unreliable because Harrington *had been exposed to the probe words*.[234] Perhaps exposing Harrington to the probes could have tainted his test—but the court has no reason to be concerned exposure could have enhanced Harrington's ability to "pass" the test.[235] If the words *had* tainted the test by being revealed to Harrington, that problem would have manifested itself as an information-*present* (because he was familiar with it) result, rather than Harrington's information-*absent* result.[236] Therefore, it is an information-present response that requires further inquiry regarding leaked information.[237] An information-absent response means Harrington either never had that information or did not remember that information.

These complexities of Brain Fingerprinting would be more easily accepted and understood by courts today if the courts of yesterday had properly received polygraph evidence.[238] American courts failed to establish the GKT as a distinct and legitimate form of polygraph. Because courts have refused to recognize the distinctions between the GKT and the CQT, courts stripped Brain Fingerprinting of this ready standard of comparison. This forces Farwell to independently establish the entire theory of Brain Fingerprinting before he can introduce the evidence at trial.[239] This essentially requires Farwell to first establish the conventional GKT underpinnings[240] before he then, ironically, must distinguish his

232. *Id.*

233. *Id.*

234. *Harrington*, No. PCCV 073247, at 10.

235. *See* Harrington Brief, *supra* note 229 (emphasis added).

236. *Id.*

237. *Id.*

238. Brain Fingerprinting follows a format similar to the traditional GKT in a "multiple choice" sense, but "it seems the use of the P300 and the elaboration of the guilty knowledge test is likely to be more accurate and an improvement over the conventional applications that have been used for much of the last forty years." Transcript of Proceedings at 170, Harrington v. State, No. PCCV 073245 (Iowa Dist. Ct. for Pottawattamie County 2001).

239. *See* Transcript of Proceedings at 4–145, *Harrington*, No. PCCV 073245.

240. *See id.* at 153 (Dr. Iacono testimony fleshing out the details of the GKT).

technology from the traditional forms of the GKT.[241] Although some courts and legal pundits have approached Brain Fingerprinting with skepticism,[242] Brain Fingerprinting science is not too novel to be taken seriously. Rather, courts should understand Brain Fingerprinting for what it is: an extension and improvement upon the GKT using a scientifically valid and reliable measurement of event-related potentials. Although Farwell's technology (based on sound scientific principles) should survive on its own two feet, its introduction to courts would certainly be less demanding if the GKT had been properly understood in the first place. The science underlying both the GKT and Brain Fingerprinting passes *Daubert* muster.

VII. ERP-GKT/BRAIN FINGERPRINTING POSSESSES SIGNIFICANT EVIDENTIARY VALUE

The scientific literature indicates the CQT has been hotly debated and falls short of the *Daubert* requirements. The GKT remains a more viable option in the criminal justice context when relevant details are known only to a select few. However, the traditional GKT can be affected by countermeasures, resulting in false-negative outcomes.[243] In addition to the advantages already noted, Brain Fingerprinting and similar ERP-GKT designs are the superior GKT applications because of the difficulty (or impossibility) of thwarting the test with countermeasures.

Scientific experts should guide courts' evidentiary assessments. To the extent courts approach a particular technology with caution, courts should define the risks as the relevant scientific community defines those risks. Courts must tread carefully to avoid impulsive reliance on seemingly intuitive considerations. When a court attempts to elaborate upon scientific authority with its own opinions, a court runs the risk of providing a scientifically unsupported opinion.

First, as fleshed out above, no psychophysiology expert disputes the legitimacy of the *science* underlying the ERP-GKT. Although Dr. Farwell's novel MERMER technique and accompanying algorithms may not yet be accepted within the scientific community, the ERP-GKT application of Brain Fingerprinting has been accepted by scientists as a legitimate method of detecting when a subject finds particular information

241. *See id.* at 168 (using direct examination to establish through Dr. Iacono's testimony what distinguishes Brain Fingerprinting and the GKT).

242. *See, e.g.*, Solovitch, *supra* note 189.

243. Ben-Shakhar & Elaad, *supra* note 63, at 94.

relevant.[244] Criticisms of the P300-GKT from the relevant scientific community derive from two independent assertions: (1) the test may be vulnerable to countermeasures; and (2) the test is vulnerable to subjectivity calls made by sloppy test administrators. For the reasons laid out below, each contention does present important considerations, but neither should be used as a basis for exclusion of P300-GKT evidence.

A. *Countermeasures*

The emergence of ERP-GKTs and Brain Fingerprinting sparked hope that a technology could be developed that would make any countermeasure attempt ineffectual.[245] The traditional GKT may be manipulated relatively easily, rendering it less than "an ideal index of memory, even though it works reasonably well as the studies suggest."[246] A galvanic skin response may not always be elicited if a subject is simply under-aroused, and the response may be affected by emotions or extraneous factors (such as taking a deep breath).[247] A galvanic skin response may also be deliberately manipulated (e.g., by a subject biting his tongue).[248] In contrast, an event-related potential in one's brain "is not easily affected by all of these other types of factors."[249]

Iacono and his colleagues have conducted studies comparing relative effectiveness of galvanic skin responses to the P300 classifications of subjects' memories.[250] Iacono testified at the Harrington trial, "you can calculate a statistic that summarizes the effectiveness of these techniques . . . . I won't go into the complex nature of that, but it's a number that varies

244. Ruling, *Harrington*, No. PCCV 073247 at 9 (admitting the P300-GKT Brain Fingerprinting evidence, but not admitting results of Farwell's MERMER version of the test).

245. *See, e.g.*, Transcript of Proceedings at 170, *Harrington*, No. PCCV 073245 (Dr. Iacono testified the P300 application and elaboration of the GKT will likely improve accuracy of the traditional GKT as the GKT has been applied for the last forty years.).

246. *Id.* at 169.

247. *Id.* at 168–69.

248. *Id.* at 169.

249. *Id.*

250. *See, e.g.*, J.J.B. Allen & W.G. Iacono, *A Comparison of Methods for Analysis of Event-Related Potentials in Deception Detection*, 34 PSYCHOPHYSIOLOGY 234 (1997) [hereinafter Allen & Iacono, *Comparison*]; J.J.B. Allen & W.G. Iacono, *The Identification of Concealed Memories Using the Event-Related Potential and Implicit Behavioral Measures: A Methodology for Prediction in the Face of Individual Differences*, 29 PSYCHOPHYSIOLOGY 504 (1992) [hereinafter Allen & Iacono, *Methodology*].

between zero and one."[251] In the context of the GKT, "one" is perfect accuracy.[252] Iacono testified the literature illustrates the conventional GKT's classification accuracy ranges from approximately .77 to .85.[253] However, the P300 extension of the GKT (including Brain Fingerprinting) classification accuracy is near-perfect, with results of about .98 to .99.[254] Researchers can employ a bootstrapping technique for determining statistical confidence, which allows for the classification of either "information present," or "information absent," as well as a category of "indeterminates" when the statistical confidence does not strongly indicate either the presence or absence of information.[255] Studies have resulted in "perfect classification accuracy for both innocent and guilty subjects when inconclusive outcomes were removed from the analyses."[256]

In 2002, Sasaki, Hira, and Matsuda conducted a study finding "little evidence of countermeasure effectiveness" by using a mental countermeasure.[257] Recently, J. Peter Rosenfeld surfaced as a critic of the ERP-GKT, positing research suggesting countermeasures may defeat a ERP-GKT test.[258] However, Rosenfeld's research design and methodology fundamentally differed from that employed in independent studies by Farwell or Iacono.[259]

Rosenfeld's research merely suggests varying ERP-GKT applications produce varying results. Rosenfeld trained his experimental group in countermeasures.[260] For example, in one test, the probe was "cow" and the target was "pig."[261] In the framework Rosenfeld used, "guilty" participants already knew "cow" was significant, and both guilty and innocent were

251. Transcript of Proceedings at 170, *Harrington*, No. PCCV 073245.

252. *Id.*

253. *Id.*

254. *Id.*

255. Farwell & Smith, *supra* note 164, at 135, 136, 139.

256. William G. Iacono, *Detection of Deception*, *in* HANDBOOK OF PSYCHOPHYSIOLOGY 688, 696 (J.T. Cacioppo et al. eds., 3d ed. 2007) (citing studies by Allen & Iacono (1997), Farwell & Donchin (1991), and Farwell & Smith (2001)).

257. *Id.* at 697.

258. J. Peter Rosenfeld et al., *Simple, Effective Countermeasures to P300-Based Tests of Detection of Concealed Information*, 41 PSYCHOPHYSIOLOGY 205 (2004).

259. *See* Iacono, *supra* note 256, at 697–98 (providing an overview of the differences in Rosenfeld's study from prior studies). *Compare* Rosenfeld et al., *supra* note 258, at 205, *with* Allen & Iacono, *Comparison*, *supra* note 250, at 234, Allen & Iacono, *Methodology*, *supra* note 250, at 504, *and* Farwell & Smith, *supra* note 164, at 135.

260. Rosenfeld et al., *supra* note 258, at 206.

261. *Id.* at 208.

given the information, "pig" to elicit the "I recognize that"-P300 control response.[262] The participants were then told to perform the same "covert countermeasure behavior" (e.g., "wiggling the big toe in the *left* shoe") each time the subject responded to the irrelevant stimuli (e.g., any other animal, which in this case was horse, sheep, goat, or mule).[263] This countermeasure worked to the extent some subjects elicited a similar P300 for the irrelevants and the targets (and the probe, for the guilty subjects).[264] Such a result offers little value because "*no test should be accepted as valid if the irrelevant and target stimuli cannot be easily differentiated*."[265] Even Rosenfeld acknowledged this problem with his analysis.[266] Thus, Rosenfeld did not use target stimuli in the same way Farwell uses them. Significantly, Rosenfeld only further proved Farwell's technique; through his coaching the subjects, the irrelevant stimuli were no longer irrelevant stimuli.[267] Rosenfeld was not operating under Farwell's method of one probe, one target, and four irrelevants; Rosenfeld transformed the framework into one probe, one target, and four more targets.[268] It comes as no surprise that when a researcher provided information to a subject, the subject's P300 response indicated that information was present in the subject's brain.

Rosenfeld did not include a category for inconclusive results as other researchers have, which exaggerated the effectiveness of Rosenfeld's "countermeasures."[269] If a probe response more closely resembled an irrelevant response than a target response, Rosenfeld classified the subject as nondeceptive without taking into account the degree of similarity between probe and irrelevant stimuli responses.[270] Additionally, as Rosenfeld conceded,[271] looking to response time could have assisted Rosenfeld in properly classifying his subjects.[272] Significantly,

262. *Id.* at 208–09.

263. *Id.*

264. *Id.* at 214.

265. Iacono, *supra* note 256, at 697.

266. Rosenfeld et al., *supra* note 258, at 214 (recognizing that, because all three kinds of stimuli produced a similarly small P300 response, "probably . . . all were meaningful").

267. *See id.*

268. *See id.* at 209 ("Thus the essential countermeasure strategy was to make presumed irrelevant stimuli relevant.").

269. *See* Iacono, *supra* note 256, at 697 (explaining Rosenfeld's study did not include an "inconclusive" category).

270. *Id.*

271. Rosenfeld et al., *supra* note 258, at 217.

272. Iacono, *supra* note 256, at 697.

disproportionate "yes" responses to probe stimuli by an innocent subject (one of the ways Rosenfeld argued his countermeasures were effective) would cast doubt on a test's validity.[273] Although "discrepant behavioral data should at least cast doubt on the validity of the[se] ERP analyses", Rosenfeld's research does illustrate that "the important question is not whether ERPs and associated behavioral data can be altered by countermeasures, but whether countermeasures can be used easily without being detected or generating an inconclusive result."[274] Rosenfeld's research does not truly address this question, and existing studies support Farwell's assertions regarding the accuracy of Farwell's design and methodology.

Some reporters have inaccurately cited Rosenfeld's research as somehow undermining the theory of Brain Fingerprinting.[275] In reality, Rosenfeld merely built upon the same principles to show subjects can turn irrelevant stimuli into relevant stimuli, which results in a P300, indicating the stimulus is relevant to them.[276] This disproves none of Farwell's contentions regarding the science underlying the technologies.

Even giving Rosenfeld's assertions the most generous benefit-of-the-doubt construction, Rosenfeld would have only demonstrated a potential for false-negatives (incorrectly labeling a guilty subject as innocent). Recall that when a researcher properly conducts a "GKT with a sufficient number of items [there is] almost no chance of producing a false-positive

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> Although as many as 9 of the 11 subjects in the countermeasure group were deemed to beat the test in certain ERP analyses, only three subjects in this group produced manual reaction times to probe and irrelevant stimuli that were as fast as those of even the slowest innocent subjects. Again, such discrepant behavioral data should at least cast doubt on the validity of the ERP analyses.

Id.

273. *Id.* (noting "there is no reason for any innocent person to respond disproportionately with 'yes' responses to probe stimuli"). Iacono also questioned the salience of the probes Rosenfeld chose to use in his study. *Id.*

274. *Id.*

275. *See, e.g.*, Carolyn Fox, *Brain Fingerprinting: Skepticism*, AM. OBSERVER, Mar. 29, 2006, http://observer.american.edu/032906/brain_skepticism_032906.htm (reporting Rosenfeld's assertion, "'The problem with current systems, including Brain Fingerprinting, is the way it's implemented. There are counter measures to beat it.'"). As fleshed out throughout this section, Rosenfeld used a wholly distinct research design and method from those shown successful by other researchers, such as Farwell's Brain Fingerprinting.

276. *See* Rosenfeld et al., *supra* note 258, at 217.

outcome."[277] Therefore, particularly for the prosecution, a response indicating the information is relevant to the subject (i.e., "this one is guilty") would be even more valuable if countermeasures could be proven effective. For example, if parties stipulated to a GKT or Brain Fingerprinting test and the defendant passed the test, the prosecution could present evidence regarding countermeasures—such as their availability, how easily they could be used, etc. However, if a defendant assumed the risk by stipulating to a test and then "failed" a test using accurate, crime-relevant information, the test results become incredibly relevant and probative of that subject's guilt.

Since *Daubert*, courts have made an even stronger statement of confidence in our jury system. Juries should be presented with as much relevant information as possible.[278] When it comes to polygraphy, it seems wisest for the courts to differentiate between the CQT and the GKT, and reassess stipulation. Stipulation is a questionable way to handle suspect evidence because relevant and reliable evidence should not be barred from court upon the unilateral decision of opposing counsel.[279] On the flipside, if courts find a particular class of evidence neither relevant nor reliable, stipulation should never be allowed: "Surely, courts of law would not countenance using . . . testimony of a ouija board interpreter, no matter how much advance stipulation by the parties had taken place."[280] Thus, CQT evidence should not be presented in court, but courts should not shy away from allowing the introduction of more legitimate psychophysiological evidence. Despite the cynics' assertions, Brain Fingerprinting and similar ERP-GKT science remain the most valuable psychophysiological measure relating to guilty knowledge. Any critique focusing on countermeasures should go to the weight, not admissibility, of the evidence.

The literature firmly established a ERP-GKT "information-present" result clearly means the particular information is, indeed, relevant to that subject. How the information got there, or whether the chosen probes lack the required memorability to elicit a P300, are issues arising in the context of the second criticism of the ERP-GKT.

277. Iacono, *supra* note 256, at 689.

278. This is a basic premise of the Federal Rules of Evidence.

279. Brief for Nat'l Ass'n of Criminal Defense Lawyers as Amicus Curiae Supporting Respondent at *10 n.4, United States v. Scheffer, 523 U.S. 303 (1998) (No. 96-1133).

280. *Id.*

B. *Science and Subjectivity*

The state's witness in Harrington's trial did not attempt to undermine the science involved in a P300-GKT; rather, the witness attacked the subjectivity involved in Brain Fingerprinting.[281] Dr. Donchin agreed that the underlying science was firmly established and that a lack of P300 response to a probe indicated the subject failed to recognize the stimulus.[282] Donchin also asserted that the development and selection of probes before administering the test, as well as any inferences drawn after conducting a test, fall outside the realm of science.[283] However, this should not be classified as a "criticism" of Brain Fingerprinting because Farwell has gone to great lengths to distinguish the scientific components of Brain Fingerprinting from the non-scientific components.[284] Farwell explains the application of Brain Fingerprinting as the ERP-GKT should be understood as: a process involving an investigation and interview phase, a scientific testing phase, and an adjudication phase.[285] Only the scientific testing phase falls within the province of science.[286] First, a skilled investigator or interviewer investigates the crime, gathers evidence, interviews the subject and witness, and develops probes.[287] The value of this information-gathering phase turns upon the professional skill of the investigator/interviewer. Special concerns in this initial phase of Brain Fingerprinting do exist, such as problems with the salience of certain memories (whether a criminal is likely to remember a particular fact) or the ability of an examiner to find probes to which a suspect has not been exposed. However, these concerns arising in the initial phase of the Brain Fingerprinting process present challenges to the *administration* of the test, not to the *accuracy* of the test.[288] Perhaps an investigation yields a weak or

281. Transcript of Proceedings at 204, Harrington v. State, No. PCCV 073245 (Iowa Dist. Ct. for Pottawattamie County 2001) (Dr. Donchin testified "[t]here is no science to the choice of the probes.").

282. *Id.* at 215–16.

283. *Id.* at 215–17 (testifying the selection of probes and the drawing of inferences is an "art," not a science).

284. *See, e.g.*, *id.* at 24–25.

285. Farwell, *supra* note 211, at 1.

286. *Id.* at 8.

287. *See id.* at 2–7.

288. *See* Farwell & Smith, *supra* note 164, at 142 ("Crime-relevant information possessed by the subject for legitimate reasons is a limitation on the applicability, not on the accuracy, of the technique."). The test administrator should interview the subject regarding each "class" of questions before conducting the test to ensure none of the possible responses "have personal significance that could elicit a recognition response even if the individual was not involved in the crime." Iacono, *supra* note 256,

inappropriate testing format. There is a safeguard against a poorly constructed Brain Fingerprinting test: a judge or jury assigns a value to the test results after assessing the manner in which the investigators, interviewers, and scientists performed their respective roles.[289] Again, this step involves no science, but such determinations are consistently made in our courts of law.

Certainly, the danger of subjectivity playing into the selection of probes remains, especially in a post-conviction case where the probes are potentially based on information from years before. Farwell acknowledges in his work that the test can only be as good as its probes.[290] All psychophysiologists who promote the GKT recognize this as its limitation.[291] The "science" component of Brain Fingerprinting rests on the P300 application of the GKT, which is indisputably established as reliable, for reasons already noted. The last phase (adjudication) involves the inferences drawn from test results, and this phase falls into the hands of a judge and jury.[292] Subjectivity does come into play in the formation of the test and in drawing inferences of guilt or innocence. Subjectivity, however, does not render a science worthless.

C. *The GKT and Brain Fingerprinting Compared to Latent Print Expert Testimony*

The complicated technology behind and innovative nature of ERP-GKT science necessarily implicates a reasonable inquiry into its reliability. In contrasting the GKT and other technologies, it seems evidence regarding other, less reliable and equally (if not more) subjective science has been grandfathered in to U.S. courts without being measured against a similarly stringent standard.[293]

Latent fingerprint evidence, for example, has been called into

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at 697.

289. Farwell, *supra* note 211, at 12.

290. Farwell & Smith, *supra* note 164, at 142.

291. *E.g.*, Ben-Shakhar et al., *supra* note 67, at 147 (recognizing that finding enough salient details of a crime to put together a test may be part of the reason the method is rarely used in North America); Carmel, *supra* note 92, at 261 (noting that the GKT is difficult to implement).

292. Farwell, *supra* note 211, at 10–11.

293. *See, e.g.*, United States v. Havvard, 260 F.3d 597, 599 (7th Cir. 2001) (allowing expert to testify that error rate is zero without further examination of the allegation); State v. Quintana, 103 P.3d 168, 169 (Utah Ct. App. 2004) (holding that "fingerprint identification is not novel scientific evidence").

question in a number of cases recently.[294] While the concept of latent print identification is far from novel, criticism of its admissibility is, in fact, relatively new to American courts.[295] As an example of a typical fingerprint identification criticism, Robert Epstein wrote that "[w]hile fingerprint examiners have long claimed the mantle of science so as to bolster the credibility of their profession, the reality is that the fingerprint community has never conducted any scientific testing to validate the premises upon which the field is based."[296] The consensus among the critics is that there exist no published scientific studies truly addressing the reliability of latent print identification or its error rates.[297] In fact, until very recently, even the foundational assertion that no two fingerprints are alike had not been subject to a meaningful statistical study to establish such a contention as fact.[298] No peer-reviewed published works demonstrate the reliability of the process.[299] Additionally, there are no true standards or

294. *See, e.g.*, Brief for Mark Acree et al. as Amici Curiae Supporting Defendant-Appellant, Commonwealth v. Patterson, at 28–37 (S.J.C. No. 09478) (urging the court to recognize the flaws inherent in latent fingerprint science and describing deficient reliability standards).

295. *See* Simon A. Cole, *More Than Zero: Accounting for Error in Latent Fingerprint Identification*, 95 J. CRIM. L. & CRIMINOLOGY 985, 985–86 (2005) (discussing "probably the most highly publicized fingerprint error ever exposed" regarding the case of Brandon Mayfield, a man who was arrested for a 2004 bombing based on fingerprint evidence that incorrectly identified him).

296. Robert Epstein, *Fingerprints Meet* Daubert*: The Myth of Fingerprint "Science" Is Revealed*, 75 S. CAL. L. REV. 605, 622 (2002).

297. *See, e.g.*, LYN HABER & RALPH NORMAN HABER, *Error Rates for Human Latent Fingerprint Examiners*, AUTOMATIC FINGERPRINT RECOGNITION SYSTEMS 339, 358 (Nalini K. Ratha & Ruud Bolle eds., 2004) ("Our careful search of all of the professional research literature turned up not a single experiment on examiner accuracy . . . . Such data simply do not exist, even though examiners have testified in court about their infallible accuracy in making fingerprint comparisons for almost 100 years."); Simon A. Cole, *Grandfathering Evidence: Fingerprint Admissibility Rulings from* Jennings *to* Llera Plaza *and Back Again*, 41 AM. CRIM. L. REV. 1189, 1205 (2004) ("Neither Dr. Stoney nor myself—both of whom have written doctoral dissertations concerning fingerprint identification—have found any scientific study of the accuracy of fingerprint identification.").

298. *See* Epstein, *supra* note 296, at 623 (noting there have been no analyses to ascertain the probability that two humans could have similar ridge characteristics, and contrasting the lack of such testing against the area of DNA analysis, in which studies have been conducted to determine the likelihood of an accidental match). *But see* United States v. Llera Plaza, Nos. CR. 98-362-10, CR. 98-362-11, 98-362-12, 2002 WL 27305, at *3 (E.D. Pa. Jan. 7, 2002) (highlighting the testimony of Donald Ziesig, who stated his algorithmic study showed "the probability of finding two people with identical fingerprints was one in ten to the ninety-seventh power").

299. *See* Brief for Mark Acree et al. as Amici Curiae Supporting Defendant-

qualifications fingerprint analysts must meet before being deemed an "expert" in the court's eyes.[300] The ACE-V methodology used by print examiners is riddled with subjectivity as the examiners make numerous judgment calls—particularly at the stage in which the examiners attempt to ascertain the quality of the print.[301]

In sum, defendants' motions to suppress fingerprint expert testimony generally look the same, arguing the testimony fails *Daubert*, *Kumho*, and Rule 702 because "fingerprint identification analysis has not been tested scientifically, it has not been subjected to peer review and publication, it has a practitioner error rate that is unknown, it is a subjective determination without any minimum point standards for identification, and there are no uniform qualification standards for fingerprint examiners."[302]

Despite the criticisms, U.S. courts continue to eagerly admit latent print evidence without a searching inquiry as to its reliability, or a discussion of how to properly treat such evidence once admitted.[303] Certainly the idea that "[f]ingerprint evidence is the strongest evidence of identity, and is ordinarily sufficient alone to identify the defendant"[304] seems a pervasive opinion of American citizens, as well as the judicial system.[305] Fingerprint testimony has historical acceptance, and is no longer

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Appellant at 28–35, Commonwealth v. Patterson (S.J.C. No. 09478) (noting the prosecution failed to offer even one citation from a scientist or academic supporting the contention that latent print individualization is documented; rather, the prosecution only offered one expert who testified to the uniqueness of friction ridges, not on the reliability of the process).

300. *See, e.g.*, Cole, *supra* note 295, at 994 ("There are no qualifications necessary to render an individual a 'latent print expert'; whether to let an individual testify as such is entirely up to the court.").

301. *See* United States v. Llera Plaza, 188 F. Supp. 2d 549, 552 (E.D. Pa. 2002).

302. United States v. Cline, 188 F. Supp. 2d 1287, 1293 (D. Kan. 2002).

303. *See, e.g.*, State v. Parks, 556 S.E.2d 20, 24 (N.C. Ct. App. 2001) (holding that the North Carolina Supreme Court considers fingerprint evidence as "an established and scientifically reliable method of identification"); State v. Quintana, 103 P.3d 168, 169 (Utah Ct. App. 2004) (stating that the state supreme court made clear "fingerprint evidence is not 'subject to reliability problems' sufficient to justify special treatment").

304. People v. Riser, 305 P.2d 1, 15 (Cal. 1957).

305. *See Quintana*, 103 P.3d at 171 ("[F]ingerprint evidence is often all that is needed to convict a defendant, even in the absence of any other evidence of guilt."). Benedict further illustrated this point by saying, "[s]o exalted are fingerprints that proponents of other forms of scientific evidence have routinely named their respective technologies to evoke the certainty and reliability of fingerprints." Benedict, *supra* note 5, at 520. Brain Fingerprinting is no exception.

considered novel science.[306]

Not only are courts eager to accept latent print testimony, experts frequently testify that latent fingerprint identification is infallible while agencies, including the FBI, tout the same claim.[307] Cole aptly summed up the status of fingerprints in the court:

> Latent print examiners have long claimed that fingerprint identification is "infallible." The claim is widely believed by the general public . . . . Curiously, the claim even appears to survive exposed cases of error, which would seem to puncture the claim of infallibility. Such cases have been known since as early as 1920 and have not disturbed the myth of infallibility. Today, latent print examiners continue to defend the claim of infallibility . . . .[308]

Obviously, a discipline with known errors cannot claim to have an error rate of zero.[309] This is eerily similar to CQT polygraphers willing to testify to low error rates and high hit rates when there is essentially no way to verify that claim.[310]

When grappling with latent print testimony, the judicial system sidestepped the criticism in recent cases by reminding the critics that *Kumho* extended the holding of *Daubert*, and expert testimony need not be scientific to be admissible.[311] Thus, because Rule 702 allows an expert to

306. *E.g.*, *Quintana*, 103 P.3d at 169 (concluding that "fingerprint evidence is not novel scientific evidence").

307. *See, e.g.*, United States v. Havvard, 260 F.3d 597, 599 (7th Cir. 2001) (noting that the expert witness "testified that the error rate for fingerprint comparison is essentially zero"); Cole, *supra* note 295, at 1197 ("[F]ingerprint examiners still believe it is appropriate to testify that they are absolutely certain that they do not make errors, even though clear evidence demonstrates that the technique does makes [sic] errors."). The FBI continues to make such a claim, stating on its website, "Fingerprints offer an infallible means of personal identification." Federal Bureau of Investigation, *Fingerprint Identification: An Overview*, http://www.fbi.gov/hq/cjisd/ident.htm (last visited May 9, 2007).

308. Cole, *supra* note 295, at 987.

309. Professor Cole recently compiled an annotated list of twenty-two fingerprint misidentifications, which, as he states, presumably "are most likely only the tip of the proverbial iceberg of actual cases of fingerprint misattribution." *Id.* at 991. His article also explains that "proficiency test[s] of latent print examiners . . . also show a non-zero error rate." *Id.*

310. *See supra* notes 100–03 and accompanying text.

311. *See Havvard*, 260 F.3d at 600 (holding that *Daubert*'s standards can be applied to all expert testimony, not just scientific evidence).

testify when he has "technical, or other specialized knowledge,"[312] courts essentially rely on the traditional acceptance and admit fingerprint evidence as being offered by an expert with specialized, rather than scientific, knowledge. This can be analogized to polygraph testimony: just as courts are willing simply to rely on the historical assumption latent print evidence is "good," courts maintain polygraph evidence is "bad."

1. *Subjectivity Can Be Properly Allowed*

Though courts continue to admit latent print evidence, courts are beginning to acknowledge subjectivity is certainly involved in the process.[313] The courts willingly overlook the subjectivity inherent in latent fingerprint evidence testimony because of what the court considers to be its own "general acceptance" (even if "general acceptance" means within the judicial community, rather than scientific community).

When considering latent print testimony, the *Llera Plaza* court acknowledged that some aspects of latent print examination procedures involve objective analyses, but "[t]he difficulty comes into play at the stage at which . . . experienced specialists . . . acknowledge[] the ACE-V process becomes 'subjective'. . . ."[314] The court nonetheless permitted testimony by experts because of their experience and training.[315]

Therefore, the court acknowledged and allowed subjectivity when coupled with science. There is no reason courts should refuse to do so with the GKT, the ERP-GKT, or Brain Fingerprinting.

Similarly, in *Cavazos v. State*, fingerprint evidence was allowed that had been visualized by an unspecified chemical process, even though there was no proof the process was reliable and accepted within the scientific community.[316] The process was said to "enhance" evidence already available.[317] Certainly Farwell would argue his MERMER variation of the ERP-GKT is based upon sound scientific processes and merely "enhances" already viable evidence under *Daubert*.

As noted with the application of the traditional GKT, studies have begun exploring what aspects of a crime are most noticed by a criminal.[318]

312. FED. R. EVID. 702.
313. *See* United States v. Llera Plaza, 188 F. Supp. 2d 549 (E.D. Pa. 2002).
314. *Id.* at 552.
315. *Id.*
316. Cavazos v. State, 779 P.2d 987, 989 (Okla. Crim. App. 1989).
317. *Id.*
318. *See supra* notes 152–56 and accompanying text.

This would increase the reliability of Brain Fingerprinting as well.

Just as skilled investigators must fulfill their roles in gathering crime-specific information before evidence of latent prints or DNA may be admitted, a skilled investigator may be trusted to construct ERP-GKT probes based on salient, crime-specific information the suspect denies knowing. "The details uncovered by investigation are used as evidence in virtually every trial. . . . When found to be relevant and based on reliable methodology, such evidence and testimony are universally accepted as a viable part of the proceedings in court."[319] Similarly, just as our judicial system trusts a jury to weigh evidence and make a guilt or innocence determination, so too is a jury capable of making an inference based on the results of an ERP-GKT/Brain Fingerprinting test.

VIII. CONCLUSION

Latent fingerprint science reliability has been seriously called into question. In 2005, the FBI announced bullet comparisons would be permanently discontinued after it was shown that the system rested on flawed assumptions and its accuracy was overstated in countless trials.[320] Eyewitness testimony, which used to be presumed the most convincing evidence available, has been shown to be incredibly unreliable and the leading cause of wrongful convictions.[321] Allowing such shoddy evidence in courtrooms while keeping out demonstrably reliable evidence is not the aim of *Daubert*.[322]

The attitude of the courts in regard to such issues can be summed up by the following statement in *Brown*: "The nature of the polygraph examination is closer to a psychiatric evaluation than to objective scientific analysis such as fingerprints and ballistics. The polygraph technique is

319. Farwell, *supra* note 211, at 7.

320. Press Release, U.S. Fed. Bureau of Investigation, FBI Laboratory Announces Discontinuation of Bullet Lead Examinations (Sept. 1, 2005), *available at* http://www.fbi.gov/pressrel/pressrel05/bullet_lead_analysis.htm.

321. The leading expert in this field, Dr. Gary Wells, provides extensive research on eyewitness testimony at his homepage, http://www.psychology.iastate.edu/faculty/gwells/ (last visited May 9, 2007).

322. Simmons, *supra* note 78, at 1045 ("One study from more than thirty-five years ago compared the accuracy of polygraph tests with fingerprint identification, handwriting analysis, and eyewitness identification, and concluded that the polygraph test was as accurate as any of the other forensic techniques, and far more accurate than an eyewitness identification."). As technology has advanced, the CQT polygraph, fingerprint, handwriting, and eyewitness analyses have come under fire, but the validity of the GKT has been bolstered.

heavily dependent on the subjective evaluation of the expert both in the administration of the test and in reaching the result."[323] The courts continue to operate under the assumption fingerprints and ballistics are scientifically sound, and a continuing misconception exists regarding the state of polygraphs and innovative ways polygraph science can be used.

That courts misunderstand some intersects of science and the law is understandable to a degree. "At some point, however, supposition has to give way to science, and good faith yet erroneous assumptions must be replaced by realities."[324] Although there is a high demand for the development of an effective lie detector, our fast-paced and commercialized culture threatens "a replay of the polygraph experience: the marketing of a halfway technology not quite capable of separating lying from other cognitive or emotional tasks."[325] Concededly, legal professionals should not seek hurried answers to multifaceted issues.[326]

However, law must tolerate science setting the proper scientific evidentiary considerations. When a court must analyze complex scientific evidence, the court should identify the relevant scientific experts and then rely on those experts' authority on the subject. Courts must examine evidence in the proper legal framework and consider differing points of view, but courts should resist the temptation to erroneously exercise scientific expertise in place of legal expertise. Interpreting science is a fitting role for a court; inventing science is not. When judges rely on their own instincts regarding science, they may be disregarding the appropriate scientific considerations and supplanting scientific truths with judicially created falsehoods.

"Lie detection" is moving beyond mere measures of emotional arousal. The ERP-GKT, or Brain Fingerprinting, as explained in detail above, offers perhaps the most promising direction.[327] New technologies

323. State v. Brown, 687 P.2d 751, 772 (Or. 1984); *see also* Florence v. Commonwealth, 120 S.W.3d 699, 702 (Ky. 2003) (identifying certain scientific methods that allow the judge to take judicial notice of reliability, naming ballistics and fingerprint analyses as two such "sciences" whose reliability would be judicially noticed, and thus would not require a *Daubert* hearing).

324. Brief for National Association of Criminal Defense Lawyers as Amicus Curiae Supporting Respondent at *5, United States v. Scheffer, 523 U.S. 303 (1998) (No. 96-1133), 1997 WL 436149.

325. Henig, *supra* note 24, at 76.

326. *See id.* (citing Georgetown University neurologist Tom Zeffiro's concern "technology that might not be thoroughly evaluated might be put into practice").

327. *See* NAS Report, *supra* note 28, at 174. The National Academy of Sciences Committee was, in general, critical of the polygraph. *Id.* Despite its negative

and scientific endeavors are compelling courts to reconsider historical preconceptions and to explore new ways to apply the *Daubert* standard. Interestingly, *Daubert* and its progeny are a relatively new introduction to American jurisprudence—yet courts are being forced to grapple with its rapid evolution as new technologies, and testimony regarding such technologies, enter the courtroom.

> Doubtless the courts will be faced with novel questions of how to evaluate P300 evidence if it comes into wider use. This is a normal part of the evolution of evidence law as it accommodates new forensic techniques. It is not a reason to erect a higher barrier to scientific innovation than is normally applied or to vitiate the gatekeeping discretion historically accorded to the trial judge.[328]

Likewise, a reluctance to adopt updated approaches tempts courts and practitioners to adhere to familiar, yet antiquated, methods. Law should lag science, but law should not pace itself at an unnecessarily sluggish stride.

*Megan J. Erickson**

view of the polygraph, even this report noted, albeit cautiously, that the recent introduction of autonomic measures (such as tools measuring brain function) "may be promising alternatives to the polygraph that may be worthy of further investigation." *Id.*

328. Harrington Brief, *supra* note 229 (citation omitted).

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