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A PERFECT STORM BREWING FOR FIRE INVESTIGATORS IN COURT

BY TERRY-DAWN HEWITT & WAYNE J. MCKENNA

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A PERFECT STORM BREWING FOR FIRE INVESTIGATORS IN COURT¹

BY TERRY-DAWN HEWITT AND WAYNE J. MCKENNA²

ABSTRACT

The genesis of this piece comes from a trend the authors have observed in three separate but related areas, which the authors believe are converging into a perfect storm for fire investigators. These are: 1) the ongoing movement by courts across the nation to scrutinize more closely the reliability of expert testimony, 2) a growing apprehension about wrongful convictions stemming from faulty forensic evidence and problems in fire investigations, culminating in the revolutionary 2009 report published by the National Academy of Sciences, and; 3) the continuing development of industry standards that are raising the bar for fire investigators. Part I describes each of these forces, and then Part II demonstrates how together they are creating a mounting pressure on fire investigation experts to defend their qualifications and the reliability of their opinions in court, particularly insofar as analyzing the fire scene and interpreting fire patterns is concerned.

1. INTRODUCTION

Every once in a great while a rare confluence of forces create an event of enormous magnitude.³ When the forces are meteorological, weather forecasters use the phrase “perfect storm” to describe the outcome. The perfect storm is an apt analogy for what we predict fire investigators will face in civil and criminal litigation from three forces that have been evolving over time and are now

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² For more information about the topics in this article as they pertain to the United States or to Canada, or to obtain permission to reproduce the whole or parts of this article, please contact the authors through Terry-Dawn Hewitt at TDHewitt@McKennaHewitt.com. This article is derived from the authors’ book, *NFPA 921 In Court: A Fire Litigation Handbook for Fire Investigators and Attorneys*.

³ Wikipedia contributors, *Perfect Storm*, WIKIPEDIA, THE FREE ENCYCLOPEDIA (Dec. 19, 2013, 2:56 AM), http://en.wikipedia.org/wiki/Perfect_storm#cite_note-Rts20080101-0.

converging. These are: 1) the ongoing movement by courts across the nation to scrutinize more closely the reliability of expert testimony, 2) a growing alarm about wrongful convictions stemming from faulty forensic evidence, 3) the continuing development of industry standards that are raising the bar for fire investigators.

In the United States, the adversary or adversarial system⁴ dictates the methods used to seek the truth and justice when conflicting positions result in litigation. Therefore, it is through pre-trial and trial procedures that fire investigators are most likely to meet the most severe challenges to their methods and conclusions. It is within the litigation context that we predict the coming of a perfect storm for fire investigators. Fire investigation experts are already feeling the effects of the precursor to this storm with an escalation of the number of challenges by attorneys to the reliability and admissibility of their expert testimony in court.⁵ However, this is just the beginning. The perfect storm of litigation for fire investigators will encompass criminal as well as civil cases and will last for years. While we are confident that the eventual outcome will be the betterment of both the theory and practice of fire investigations, the transition will not be an easy one.

PART I

2. INTRODUCTION TO PART I

Part I of this article examines the three forces listed above. It first reviews the growing emphasis on the need for demonstrable reliability of expert opinions in court. Thus, we begin by reviewing the advancement of reliability requirements for expert testimony beginning with *Daubert v. Merrell Dow Pharmaceuticals Inc.*⁶ and the effect of these reliability requirements on fire experts in federal and state courts. The article then moves on to examine the problems caused by faulty forensic science, including weaknesses in fire investigations and the response by various sectors of American society to address these problems. The responses have come in the form of reports examining problems with forensic science and fire investigations, together with recommendations to address these issues. The most significant of these reports, including the 2009 publication of the National Research Council of the National Academy of Sciences, *Strengthening Forensic Science in*

⁴ BLACK'S LAW DICTIONARY (9th ed. 2009), available at Westlaw BLACKS (search for "adversary system") ("A procedural system, such as the Anglo-American legal system, involving active and unhindered parties contesting with each other to put forth a case before an independent decision-maker."); cf. *id.* (search for "inquisitorial system") ("A system of proof-taking used in civil law, whereby the judge conducts the trial, determines what questions to ask, and defines the scope and the extent of the inquiry," which ". . . prevails in most of continental Europe, in Japan, and in Central and South America.").

⁵ These challenges are launched based on the United States Supreme Court's decision in *Daubert v. Merrell Dow Pharmaceuticals Inc.*, (1993), 509 U.S. 579, or comparable decisions from state courts.

⁶ (1993), 509 U.S. 579.

*the United States: A Path Forward*⁷ (the *NRC/NAS Report*) are highlighted from the viewpoint of their importance to the fire investigation field.

All of the reports we canvassed contain recommendations to remedy the problems with faulty forensic sciences and minimize the consequent risk of injustice. Interestingly, each of them emphasizes the need for adequate standards for forensic disciplines and sufficient training for practitioners within each field. It is because of this apparent need for adequate standards for fire investigations that we address the third force contributing to the perfect storm building for fire investigators. In the context of the call for fire investigation standards, two documents developed by the National Fire Protection Association⁸ (NFPA) through its standards making process come to the fore: *NFPA 921 Guide for Fire and Explosion Investigations*⁹ (*NFPA 921*) and *NFPA 1033 Standard for Professional Qualifications for Fire Investigator*¹⁰ (*NFPA 1033*). The last section in Part I of this article introduces these industry standards, and then examines the 2014 editions of each one, describing how they are raising the bar for fire investigators.

3. THE FIRST FORCE: RELIABILITY CHALLENGES TO EXPERT TESTIMONY

With its 1993 decision in *Daubert v. Merrell Dow Pharmaceuticals Inc.*,¹¹ the United States Supreme Court struck a serious blow in the war against the use of junk science in the courtroom by implementing a new scheme making the reliability of scientific expert evidence a prerequisite of admissibility. There has been much written about *Daubert* and its impact on expert evidence, so for the purposes of this article, we will provide a bare bones review in order to place the information

⁷ COMM. ON IDENTIFYING THE NEEDS OF THE FORENSIC SCI. CMTY. *ET AL.*, NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., *STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD* (2009), available at <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf> [hereinafter *NRC/NAS REPORT*].

⁸ *About NFPA*, NAT'L FIRE PROT. ASS'N (2014), <http://www.nfpa.org/categoryList.asp?categoryID=143&URL=About%20NFPA>. On its website, the NFPA describes its mission with respect to codes and standards as follows:

The world's leading advocate of fire prevention and an authoritative source on public safety, NFPA develops, publishes, and disseminates more than 300 consensus codes and standards intended to minimize the possibility and effects of fire and other risks. *Id.*

⁹ NAT'L FIRE PROT. ASS'N TECHNICAL COMM. ON FIRE INVESTIGATIONS, *NFPA 921 GUIDE FOR FIRE AND EXPLOSION INVESTIGATIONS* [hereinafter *NFPA 921*] (1992 ed., 1995 ed., 1998 ed., 2001 ed., 2004 ed., 2008 ed., 2011 ed., 2014 ed.). We use the short form, "*NFPA 921*" when referring generally to that document, in whatever edition is applicable in the context. When referring to a specific edition of *NFPA 921*, the edition is also cited.

¹⁰ NAT'L FIRE PROT. ASS'N TECHNICAL COMM. ON FIRE INVESTIGATOR PROFESSIONAL QUALIFICATIONS, *NFPA 1033 STANDARD FOR PROFESSIONAL QUALIFICATIONS FOR FIRE INVESTIGATOR* [hereinafter *NFPA 1033*] (1987 ed., 1993 ed., 1998 ed., 2003 ed., 2009 ed., 2014 ed.). We use the short form, "*NFPA 1033*" when referring generally to that document, in whatever edition is applicable in the context. When referring to a specific edition of *NFPA 1033*, the edition is also cited.

¹¹ *Id.*

that follows into context.¹² Keep in mind that *Daubert* is a federal decision, which is technically binding only on United States federal courts. However, as we will see, it has had significant influence on state courts, most of which have adopted tests for reliability of expert testimony based in whole or in part on the *Daubert* case.

In federal court the admissibility of expert evidence is governed by Rule 702¹³ of the *Federal Rules of Evidence*, the heart of which, prior to *Daubert*, required that to render an expert opinion at trial, one had to be “qualified as an expert by knowledge, skill, experience, training, or education”¹⁴ with respect to the subject of the testimony. The key issue was therefore the expert’s qualifications, rather than the substance of his or her evidence, unless the expert’s testimony was based on novel scientific theories or techniques, in which case it was necessary to show that the foundations of the opinion were generally accepted in the relevant field.¹⁵ This general acceptance test came from a 1923 federal appellate court decision in *Frye v. United States*, known as the *Frye* “general acceptance” test. Therefore, before *Daubert*, the main prerequisite to admissibility was an expert’s qualifications. Reliability was only an issue if the expert based his or her evidence on novel scientific theories or techniques.

In overruling *Frye*, the *Daubert* decision propounded several guiding principles, one of which was to impose a gate-keeping obligation on trial judges to determine the admissibility of expert evidence based on its relevance and reliability. *Daubert* requires of experts that “(1) [their] testimony is based upon sufficient facts or data, (2) [their] testimony is the product of reliable principles and methods, and (3) [they have] applied the principles and methods reliably to the facts of the case.”¹⁶ With respect to the trial judge’s inquiry into the reliability of the evidence, the Court offered a non-definitive list of the types of factors a trial judge may decide to consider in making the determination

¹² See generally TERRY-DAWN HEWITT & WAYNE J. MCKENNA, NFA 921 AND NFA 1033 IN COURT (Oct. 2008), <http://www.cfitrainer.net/> ((login required) follow “Fire and Explosion Investigations: Utilizing NFA 1033 and 921”; then follow “launch program” hyperlink; then follow “Reading List” hyperlink; then follow “NFA 921 and NFA 1033 In Court” hyperlink) (containing a more detailed summary of the *Daubert* decision, *infra* at note 17, as it applies to fire investigations).

¹³ FED. R. EVID. 702. At the time of the decision in *Daubert v. Merrell Dow Pharmaceuticals Inc.*, (1993), 509 U.S. 579, Rule 702 provided, “If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.”

¹⁴ FED. R. EVID. 702.

¹⁵ *Frye v. United States*, 293 F. 1013 (App.D.C. 1923).

¹⁶ FED. R. EVID. 702, (as amended in 2000 to reflect *Daubert v. Merrell Dow Pharmaceuticals Inc.*, (1993), 509 U.S. 579.). In 2000, FED. R. EVID. 702 was amended to add the portion shown in italics, below:

If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, *if (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.*

of the reliability of the scientific testimony.¹⁷ These factors include, but are not limited to the following:

Testability: Whether or not a theory or technique has been or can be tested, and if the hypothesis underlying the theory or technique can be falsified.

Peer Review or Publication: “Whether the theory or technique has been subjected to peer review or publication.”

Error Rate: Whether the theory or technique has a known or potential rate of error.

Standards: “The existence and maintenance of standards controlling the technique’s operation.”

General Acceptance: Whether or not there has been general acceptance of the theory or technique in the relevant scientific community (this test was retained from the *Frye* decision.)¹⁸

The Court also made it clear that this decision set forth the gate keeping function for all scientific evidence, not just novel or unconventional scientific theories.¹⁹ It is within the discretion of the trial court whether to hold what has become known as a *Daubert* hearing to evaluate the reliability of the whole or a part of an expert’s testimony, and if so, whether to consider the factors enumerated in *Daubert* or other factors in order to decide the reliability issue. Rule 702 was eventually amended to reflect the *Daubert* decision.²⁰

Following *Daubert*, a logical question soon arose about the limits of the trial judge’s discretion when exercising this gate-keeping function and the role of appellate courts in reviewing a trial court’s decision. This question was answered by the Supreme Court’s 1997 decision in *General Electric Co. v. Joiner*,²¹ where it decided that appellate review of a decision to admit or exclude expert evidence would not be particularly stringent. To overturn a trial court’s decision on a *Daubert* motion, the appeals court would have to find that the trial judge abused his or her discretion. The result of *Joiner* is that the trial judge is free to exercise discretion to admit or exclude testimony, limited only by

¹⁷ *Daubert v. Merrell Dow Pharmaceuticals Inc.*, 509 U.S. 579, 592-593 (1993).

¹⁸ *Id.* at 593-595 (*footnotes omitted*).

¹⁹ *Id.* at 593, n.11.

²⁰ FED. R. EVID. 702. In 2011, all of the Federal Rules of Evidence were revised in an effort to make them easier to understand. The amended Rule 702 provides:

A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if: (a) the expert’s scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue; (b) the testimony is based on sufficient facts or data; (c) the testimony is the product of reliable principles and methods; and (d) the expert has reliably applied the principles and methods to the facts of the case.

²¹ *General Electric Co. v. Joiner*, 522 U.S. 136 (1997).

palpable error. Subsequently, in 1999 in *Kumho Tire Company, Ltd. v. Carmichael*,²² the Supreme Court extended the reach of *Daubert* by determining that Rule 702 and the *Daubert* reliability tests apply to technical as well as scientific knowledge.

The following year the Court rendered a decision that underscored the potentially severe implications of *Daubert* where the expert evidence is crucial to the outcome of a case and an appeal court decides it is not reliable. The case was *Weisgram v. Marley Co.*,²³ which the plaintiffs commenced after Mrs. Weisgram died from carbon monoxide poisoning caused by a fire in her home. The son of the deceased, her estate, and her homeowner insurers, brought a product liability action against Marley Co. and others alleging that the fire was caused by a defect in a baseboard heater manufactured fifteen years earlier by the defendants. The Marley Co. defendants objected to the admissibility of the evidence of the plaintiff's three expert witnesses, but the trial judge allowed this evidence at trial and the jury rendered a verdict in the plaintiffs' favor. The defendants responded with a motion for judgment, on the basis that the trial court should not have permitted the plaintiffs' experts to testify, and without their evidence, there was no proof that the heater was defective when it left the manufacturer.²⁴

The trial judge denied the motion, but the Court of Appeals for the Eighth Circuit reversed and remanded the case to the district court, directing the trial judge to enter judgment in favor of the Marley Co. defendants.²⁵ The heart of the court of appeals' decision was a meticulous review of the evidence of Weisgram's experts. The court concluded that their qualifications were insufficient to support some aspects of the opinions they rendered, that their evidence was speculative, lacked sufficient factual foundation, was not reliable, and should have been excluded at trial.²⁶ Without this expert evidence, the plaintiffs had no proof of the defect in the heater, and the defendants were therefore entitled to judgment as a matter of law.²⁷ The United States Supreme Court affirmed the decision of the appellate court.²⁸ Central to the Supreme Court's ruling was a reminder about the

²² 526 U.S. 137 (1999).

²³ *Weisgram v. Marley Co.*, 169 F.3d 514, 517 (8th Cir. 1999) (2-1 opinion).

²⁴ *Id.* at 516-517.

²⁵ *Id.* at 522.

²⁶ *Id.* at 518-521.

²⁷ *Id.* at 517-522.

²⁸ *Id.* at n.3 (2000). The Supreme Court explains the limits of its ruling in *Weisgram* as follows:

We agreed to decide only the issue of the authority of a court of appeals to direct the entry of judgment as a matter of law, and accordingly accept as final the decision of the Eighth Circuit holding the testimony of Weisgram's experts unreliable, and therefore inadmissible under Federal Rule of Evidence 702, as explicated in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 113 S.Ct. 2786, 125 L.Ed.2d 469 (1993). We also accept as final the Eighth Circuit's determination that the remaining, properly admitted, evidence was insufficient to make a submissible case under state law.
Id.

importance of the *Daubert* decision, and the onerous obligation it imposed, when the Court said, “Since *Daubert*, moreover, parties relying on expert evidence have had notice of the *exacting standards* of reliability such evidence must meet.”²⁹ [Emphasis added.]

Weisgram’s is enlightening for two reasons. First, it underscores that *Daubert* imposes an “exacting standard” for the reliability of expert evidence. Second, it demonstrates the severe consequences to a litigant who fails to ensure the reliability of expert witness testimony in a case that turns on such testimony. The Eighth Circuit’s decision is particularly instructive for the fire investigation community because it demonstrates how expert testimony based largely on interpretation of physical evidence from a fire scene such as fire patterns can be dismantled. This can be achieved by restrictively construing the qualifications of the experts combined with a thorough analysis of the factual foundations and scientific underpinnings of their inferences and opinions, guided by *Daubert’s* reliability factors.

A major outcome of the *Daubert–Joiner–Kumho–Weisgram* quartet has been to empower trial and appellate courts to wrestle with reliability issues concerning expert evidence that previously were largely ignored, excluding expert testimony where warranted. *Daubert* challenges have become commonplace and are launched with surprising success against even the most well known experts. Untold experts have had their evidence limited or excluded to such an extent that commercial tracking services have sprung up to report the performance of individual experts under *Daubert* scrutiny.³⁰

Daubert is a federal decision, applicable only in cases heard in federal courts, but its influence has spread. Most states, either through judge-made law or their legislatures, have adopted the same or similar admissibility standards requiring not only that an expert be qualified as such, but that the expert’s opinion be reliable as measured by factors such as those listed above.³¹ A few states including California and New York have declined to impose a *Daubert*-like reliability test to replace the pre-existing admissibility rule fashioned after *Frye v. United States*,³² which requires the proponent of novel scientific evidence to prove that the theories and methods used by the expert have reached the level of general acceptance by the relevant scientific community. This does not mean that *Daubert* has not had its influence in these jurisdictions. Those that apply *Frye* have been more rigorous in testing for reliability since *Daubert*.³³ Therefore, as the American Bar Association

²⁹ *Weisgram v. Marley Co.*, 528 U.S. 440, 455-456 (2000).

³⁰ See, e.g., Medex Online, Inc., Home Page, DAUBERTTRACKER.COM, available at <http://www.dauberttracker.com/index.cfm> (last visited Jan. 17, 2014) (“Our critically acclaimed DAUBERT TRACKER now makes it possible to more accurately check the ‘gatekeeping history’ of experts before retention or deposition.”).

³¹ See, e.g., Alice B. Lustre, Annotation, *Post–Daubert Standards for Admissibility of Scientific and Other Expert Evidence in State Courts*, 90 A.L.R.5th 453 (2012).

³² 293 F. 1013 (App. D.C. 1923).

³³ See, e.g., *Ficic v. State Farm Fire & Cas. Co.*, 2005 WL 946696 (N.Y.Sup., 2005) (Slip Op.) (setting aside the verdict for the defendant and entering judgment for the plaintiff, the court held that the fire expert’s opinion did not satisfy the general acceptance test from *Frye v. United States*, 293 F. 1013 (App.D.C. 1923), measuring the expert’s opinion by the

(ABA) Innocence Committee concluded in a 2006 study, “under both an increasingly stringent *Daubert* standard and a reinvigorated *Frye* test, scientific proof is being scrutinized more closely than ever before.”³⁴

Awareness that *Daubert*'s reliability standards apply to fire investigators began to surface with *Michigan Millers Mutual Insurance Corp. v. Benfield*³⁵. This case began in 1995, when the testimony of a well-qualified, highly experienced fire investigator who had testified on numerous occasions as an expert in fire cause determination was successfully challenged using the *Daubert* reliability factors, and the court excluded his entire expert testimony from trial. Needless to say, as with most successful *Daubert* challenges, the party on whose behalf he was testifying lost the case.

Since the mid-1990s, fire investigators have felt the impact of *Daubert* in federal and state courts across the United States. Where prior to this time, once a court acknowledged an expert's qualifications, the expert's opinion was typically admissible at trial, it is now not uncommon for experts to find that under *Daubert* scrutiny, all or a portion of their evidence can fail the reliability test and be excluded from trial.³⁶ This impact has been much more evident in civil than criminal cases.³⁷ However, this appears to be changing in part because of an increasing sensitivity about the

recommendations of NAT'L FIRE PROT. ASS'N TECH. COMM. ON FIRE INVESTIGATIONS, NFPA 921 GUIDE FOR FIRE AND EXPLOSION INVESTIGATIONS [hereinafter NFPA 921]. “Such an invalid and clearly erroneous expert opinion, not recognized by the expert's peers, mislead the jury into making an irrational decision that a suspicious fire is proof of an intentionally set fire.”); *Ramirez v. State*, 810 So. 2d 836, 853 (Fla. 2001) (excluding knife mark identification expert testimony, saying, “In order to preserve the integrity of the criminal justice system in Florida, particularly in the face of rising nationwide criticism of forensic evidence in general,⁵⁴ our state courts—both trial and appellate—must apply the *Frye* [293 F. 1013] test, *id.*, in a prudent manner to cull scientific fiction and junk science from fact.”) (*citation omitted*).

³⁴ AM. BAR ASS'N CRIM. JUSTICE SECTION AD HOC INNOCENCE COMM. TO ENSURE THE INTEGRITY OF THE CRIM. PROCESS, ACHIEVING JUSTICE: FREEING THE INNOCENT AND CONVICTING THE GUILTY (2006), 51, *available at* <http://apps.americanbar.org/crimjust/committees/innocencebook.pdf> [hereinafter ABA INNOCENCE REPORT] (citing *Ramirez v. State*, 810 So. 2d 836, 844 (Fla. 2001) and *Wilson v. State*, 803 A.2d 1044 (Md. 2002) as examples of the application of a reinvigorated *Frye* test.)

³⁵ 140 F.3d 915 (11th Cir. 1998).

³⁶ *See, e.g.*, *Fireman's Fund Ins. Co. v. Canon U.S.A., Inc.*, 394 F.3d 1054 (8th Cir. 2005) (excluding evidence of unreliable experiments conducted by fire investigators); *Booth v. Black & Decker, Inc.*, 166 F. Supp. 2d 215 (E.D. Pa. 2001) (excluding evidence of expert in product liability action); *Bryte ex rel. Bryte v. Am. Household, Inc.*, 429 F.3d 469 (4th Cir. 2005) (excluding expert's evidence on causation for failing to have eliminated other possible causes).

³⁷ *See, e.g.*, *State v. Schultz*, 58 P.3d 879 (Utah Ct. App. 2002) (permitting expert's testimony on canine alert in the absence of laboratory confirmation contrary to the recommendations of NFPA 921, *supra* note 33); *Commonwealth v. Goodman*, 54 Mass. App. Ct. 385, 765 N.E.2d 792 (2002) (affirming trial court's decision to admit expert testimony with questionable relationship with NFPA 921, *supra* note 33); *State v. Davlin*, 272 Neb. 139, 719 N.W.2d 243 (2006) (affirming defendant's conviction for second degree murder and found no abuse of discretion by trial court in admitting the expert evidence of two state fire experts called by the prosecution who deviated from NFPA 921's recommendations, *supra* note 33.); *US v. Santiago*, No. 05-14155, 2006, 202 F. App'x 399 (11th Cir. 2006), LEXIS 26665 (Oct. 26, 2006, 11th Cir.) (affirming the defendant's arson conviction and the district court's decision to admit the testimony of fire experts for the state who used the process of elimination to determine that the fire was incendiary.)

problems with wrongful convictions based on unreliable forensic evidence in general, and the frailties of fire scene indicators in particular. Enter the second force to which we alluded in the introduction to this article, the growing awareness about wrongful convictions stemming from faulty forensic evidence.

4. THE SECOND FORCE: INCREASING ALARM ABOUT WRONGFUL CONVICTIONS AND THE NATIONAL ACADEMY OF SCIENCES REPORT ON FORENSIC SCIENCES

4.1. GROWING UNREST ABOUT WRONGFUL CONVICTIONS FROM FAULTY FORENSIC SCIENCE

At least as far back as the early 1990s³⁸ there has been a noticeable growth in the movement to rectify wrongful convictions. Groups such as the Innocence Project, a national non-profit organization founded by Barry Scheck and Peter Neufeld affiliated with Benjamin N. Cardozo School of Law at Yeshiva University in New York,³⁹ have done much to exonerate wrongfully convicted prisoners. They have also increased the understanding of the legal community and the public at large about the extent of miscarriages of justice in America.

Across the United States, Canada, and other countries, organizations like the Innocence Project have spread over time. In part, their growing influence is through their membership in the Innocence Network, of which the Innocence Project is a founding member.⁴⁰ The Innocence Network is “an affiliation of organizations dedicated to providing pro bono legal and investigative services to individuals seeking to prove their innocence of crimes for which they have been convicted and working to redress the causes of wrongful convictions.”⁴¹ With members in 45 states and the District of Columbia,⁴² the Innocence Network has a broad base of support and influence across the

³⁸ *About the Innocence Project*, INNOCENCEPROJECT.ORG, <http://www.innocenceproject.org/about/> (last visited Jan. 17, 2014) (“The Innocence Project is a non-profit legal clinic affiliated with the [Benjamin N. Cardozo School of Law at Yeshiva University](#) and created by Barry C. Scheck and Peter J. Neufeld in 1992. The project is a national litigation and public policy organization dedicated to exonerating wrongfully convicted people through DNA testing and reforming the criminal justice system to prevent future injustice. As a clinic, law students handle case work while supervised by a team of attorneys and clinic staff.”).

³⁹ *About the Organization*, INNOCENCEPROJECT.ORG, http://www.innocenceproject.org/Content/What_is_the_Innocence_Project_How_did_it_get_started.php (last visited Jan. 17, 2014).

⁴⁰ *About the Innocence Project*, INNOCENCEPROJECT.ORG, <http://www.innocenceproject.org/about/> (last visited Jan. 17, 2014).

⁴¹ *About the Innocence Network*, INNOCENCENETWORK.ORG, <http://www.innocencenetwork.org/> (last visited Jan. 17, 2014).

⁴² *Members*, INNOCENCENETWORK.ORG, <http://www.innocencenetwork.org/members> (last visited Jan. 17, 2014).

United States. Each of the members affiliated in the Innocence Network defines the types of cases it handles. Some are limited to DNA cases while others have a broader mandate and will take on arson cases.

One of the ways that the Innocence Network has drawn attention to the weaknesses of the criminal justice system is by exploring the causes of wrongful convictions, one of which is “unvalidated or improper forensic science.”⁴³ Awareness of problems with forensic science started with a widespread concern about abuses in crime labs brought to light by DNA exonerations, exposing problems in labs throughout America. Issues ranging from negligence to intentional misconduct were investigated in a number of states including Virginia, Montana, Oklahoma, Texas, Ohio, California, Texas, and in the FBI lab.⁴⁴ The federal government reacted.

Since 2002, funding had been provided to states and local governments through the Coverdell Forensic Science Improvement Grant Program for the purposes of improving “the quality and timeliness of forensic science and medical examiner services.”⁴⁵ In 2004, Congress amended the eligibility requirements for states and local governments applying for funds, compelling them to certify as follows before becoming eligible for funding:

[W]ith respect to any forensic laboratory system, medical examiner’s office, coroner’s office, law enforcement storage facility, or medical facility that will receive any portion of the grant – that a government entity exists and *an appropriate process is in place to conduct independent external investigations into allegations of serious negligence or misconduct by employees or contractors substantially affecting the integrity of forensic results.*⁴⁶ [Emphasis added.]

Nearly every state has since certified that they have in place an entity and procedures to conduct investigations into negligence or misconduct affecting the reliability of forensic testing.⁴⁷ Furthermore, some states set up commissions to consider problems with forensic science evidence in criminal cases, for example, the Texas Forensic Science Commission,⁴⁸ the California Commission

⁴³ *Understand the Causes*, INNOCENCEPROJECT.ORG, <http://www.innocenceproject.org/understand/> (last visited Jan. 17, 2014) (listing as common causes, “eyewitness misidentification, false confessions/ admissions, government misconduct, informants or snitches, and bad lawyering”).

⁴⁴ *ABA Innocence Report*, note 34, at xii; CAL. COMM’N ON THE FAIR ADMIN. OF JUSTICE, FINAL REPORT (2008), 59-60, available at <http://www.ccfaj.org/documents/CCFAJFinalReport.pdf>.

⁴⁵ Nat’l Inst. of Justice, *Coverdell Forensic Science Improvement Grants Program*, NIJ.GOV, <http://www.nij.gov/topics/forensics/lab-operations/capacity/nfsia/welcome.htm> (last modified April 1, 2013).

⁴⁶ ABA INNOCENCE REPORT, *supra* note 34, at xii (citing the Justice for All Act of 2004).

⁴⁷ ABA INNOCENCE REPORT, *supra* note 34, at xii.

⁴⁸ *About Us*, TEX. FORENSIC SCI. COMM’N (2012) <http://fsc.state.tx.us/about/>. The Texas Forensic Science Commission was established in 2005. It “investigates complaints that allege professional negligence or misconduct by a laboratory, facility or entity that has been accredited by the Director of the Texas Department of Public Safety that would substantially affect the integrity of the results of a forensic analysis. The term ‘forensic analysis’ means a medical,

on the Fair Administration of Justice,⁴⁹ and the New York State Commission on Forensic Science.⁵⁰ In the meantime, the ABA⁵¹ also took action, creating the Ad Hoc Innocence Committee to Ensure the Integrity of the Criminal Process, which in 2006 produced a 162-page report with comprehensive resolutions addressing the causes and prevention of wrongful convictions.⁵²

4.2.GENESIS OF THE NRC/NAS REPORT ON FORENSIC SCIENCES

The birth of forensic sciences commissions across the United States was the harbinger of an even closer scrutiny of the role of forensic sciences in the justice system yet to come. Significantly, in 2005 Congress directed that funding be provided to the National Academy of Sciences to undertake what would become a groundbreaking study on forensic sciences⁵³:

The resulting analysis built upon prior [National Institute of Justice] studies in 1999 and 2004, as well as several other studies. In February of 2009, the [National Academy of Sciences] issued a final report entitled *Strengthening Forensic Science in the United States: A Path Forward*. The report concluded that the scientific practices underlying many forensics disciplines are in many respects wanting. It provided a number of recommendations on how to improve the scientific foundations of the field, which are so important to its ongoing and future credibility.⁵⁴

chemical, toxicological, ballistic, or other examination or test performed on physical evidence, including DNA evidence, for the purpose of determining the connection of the evidence to a criminal action." *Id.*

⁴⁹ CAL. COMM'N ON THE FAIR ADMIN. OF JUSTICE, REPORT AND RECOMMENDATIONS REGARDING FORENSIC SCIENCE EVIDENCE (May 8, 2007), 1, available at http://ag.ca.gov/meetings/tf/pdf/ccfaj_science.pdf.

⁵⁰ N.Y. EXC. LAW § 995-a: NY Code - Section 995-A (Commission on Forensic Science and Establishment of DNA Identification Index, available at <http://codes.lp.findlaw.com/nycode/EXC/49-B/>.)

⁵¹ *About the ABA*, AMERICANBAR.ORG (2014), available at http://www.americanbar.org/utility/about_the_aba.html. According to its website, the American Bar Association (ABA) is "one of the world's largest voluntary professional organizations, with nearly 400,000 members and 3,500 entities." The ABA accredits law schools, provides continuing legal education, information about the law, programs to assist lawyers and judges in their work, and initiatives to improve the legal system for the public. Its mission is "To serve equally our members, our profession and the public by defending liberty and delivering justice as the national representative of the legal profession." (http://www.americanbar.org/about_the_aba/aba-mission-goals.html.)

⁵² *ABA Innocence Report*, *supra* note 34.

⁵³ COMM. ON IDENTIFYING THE NEEDS OF THE FORENSIC SCI. CMTY. ET AL., NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., *STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD* (2009), available at <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf> [hereinafter NRC/NAS REPORT].

⁵⁴ NAT'L SCI. AND TECH. COUNCIL, CHARTER OF THE SUBCOMM. ON FORENSIC SCI. COMM. ON SCI. § B, available at <http://www.whitehouse.gov/sites/default/files/microsites/ostp/forensic-science-subcommittee-charter.pdf> (last visited July 18, 2012) ("In 2006, the National Institute of Justice (NIJ) issued a grant to the National Research Council (NRC) of the National Academies to establish a Forensic Science Committee to study the forensic sciences and their application throughout the Nation.").

The resulting publication, *Strengthening Forensic Science in the United States: A Path Forward* (the *NRC/NAS Report*), took more than two years to prepare, is over 300 pages in length, and contains a general overview of issues relating to forensic sciences and the law, as well as specific analyses of individual disciplines. The co-chair of the committee that authored the *NRC/NAS Report*, the Honorable Judge Harry T. Edwards, has provided this overview of its principle findings:

There are scores of talented and dedicated people in the forensic science community, and the work that they perform is very important. However, the quality of practice in forensic disciplines varies greatly. And this work often suffers greatly, because of:

- the paucity of scientific research to confirm the validity and reliability of forensic disciplines and establish quantifiable measures of uncertainty in the conclusions of forensic analyses;
- the paucity of research programs on human observer bias and sources of human error in forensic examinations;
- the absence of scientific and applied research focused on new technology and innovation;
- the lack of autonomy of crime laboratories;
- the absence of rigorous, *mandatory* certification requirements for practitioners;
- the absence of uniform, *mandatory* accreditation programs for laboratories;
- the failure to adhere to robust performance standards;
- the failure of forensic experts to use standard terminology in reporting on and testifying about the results of forensic science investigations;
- the lack of effective oversight; and
- a gross shortage of adequate training and continuing education of practitioners. [Emphasis in the original.]⁵⁵

Flowing from its study, the *NRC/NAS Report* makes 13 recommendations, the first of which is the most far-reaching, urging Congress to fund and establish an independent federal agency to oversee the forensic science disciplines in America. Additional recommendations include:

- 1) a requirement that terminology and minimum requirements for information used “in reporting and testifying about the results of forensic science investigations be standardized,”⁵⁶
- 2) that research be conducted to verify the “accuracy, reliability, and validity” of the basic premises underlying each discipline,⁵⁷
- 3) that research be conducted on human error rates and bias in forensic examinations,⁵⁸

⁵⁵ Hon. Harry T. Edwards, J., *Solving the Problems That Plague the Forensic Science Community*, 50 JURIMETRICS J. 5, 19 (2009).

⁵⁶ NRC/NAS REPORT, *supra* note 53, at 21-22.

⁵⁷ NRC/NAS REPORT, *supra* note 53, at 22.

⁵⁸ NRC/NAS REPORT, *supra* note 53, at 24.

4) that “[l]aboratory accreditation and individual certification of forensic science practitioners should be mandatory,”⁵⁹ and,

5) that practitioners comply with industry standards that reflect the best practices in their fields.⁶⁰

Several initiatives have been started because of the report. First, in 2009, the Subcommittee on Forensic Science was established. Its purpose is to “advise and assist the [President’s Committee on Science, National Science and Technology Council], and other coordination bodies of the Executive Office of the President on policies, procedures, and plans related to forensic science in the national security, criminal justice, and medical examiner/coroner systems at the local, state, and federal levels”⁶¹ To achieve its goals, the Subcommittee established five Inter-agency Working Groups (IWGs). The work of these IWGs was to include:

- Identifying and prioritizing extant research, development, testing, and evaluation related to forensic science.
- Identifying existing standards/ best practices/ guidelines/ protocols relating to identification, collection, preservation, analysis, evaluation, comparison, interpretation, terminology and reporting.
- Making recommendations for either improving existing standards and protocols or developing new ones where needed.
- Recommending a process for defining and standardizing forensic science terminology used in expert reports and testimony.
- Identifying non-accredited laboratories, forensic science units, and crime scene units.
- Outreaching to and gaining input from forensic science and criminal justice organizations including state, local, and private practitioners, and other stakeholders.⁶²

⁵⁹ NRC/NAS REPORT, *supra* note 53, at 25.

⁶⁰ NRC/NAS REPORT, *supra* note 53, at 23-25.

⁶¹ NAT’L SCI. AND TECH. COUNCIL, *supra* note 54, at § B.

⁶² See NAT’L SCI. AND TECH. COUNCIL, COMM. ON SCI., SUBCOMM. ON FORENSIC SCI., CHARTER INTER-AGENCY WORKING GROUP RESEARCH, DEVELOPMENT, TESTING AND EVALUATION, *available at* <http://www.whitehouse.gov/sites/default/files/microsites/ostp/forensic-science-rdte.pdf>, CHARTER INTER-AGENCY WORKING GROUP STANDARDS, PRACTICES AND PROTOCOLS, *available at* <http://www.whitehouse.gov/sites/default/files/microsites/ostp/forensic-science-stand-pract-prot.pdf>, CHARTER INTER-AGENCY WORKING GROUP EDUCATION, ETHICS AND TERMINOLOGY, *available at* <http://www.whitehouse.gov/sites/default/files/microsites/ostp/forensic-science-education-ethics.pdf>, CHARTER INTER-AGENCY WORKING GROUP ACCREDITATION AND CERTIFICATION, *available at* <http://www.whitehouse.gov/sites/default/files/microsites/ostp/forensic-science-accred-cert.pdf>, CHARTER INTER-AGENCY WORKING GROUP OUTREACH AND COMMUNICATION, *available at*

The IWGs started their work in 2010. It would appear that fire investigations were on their radar. The IWG on Research, Development, Testing, and Evaluation invited presentations from representatives of the Technical Working Group for Fires and Explosions (known as TWGFEX-Scene)⁶³ in July 2011, to address the scientific foundations of fire scene investigation and fire pattern interpretation.⁶⁴ The results of the work of the IWGs are not known at this time.⁶⁵

In the meantime, the government took another step in responding to the *NRC/NAS Report* by announcing its decision to establish, a “National Commission on Forensic Science” (the Commission) as part of a new initiative to strengthen and enhance the practice of forensic science.”⁶⁶ The Commission is a collaborative effort of the US Department of Justice (USDOJ) and the National Institute of Standards and Technology (NIST). Here is the purpose of this new initiative:

<http://www.whitehouse.gov/sites/default/files/microsites/ostp/forensic-science-outreach-comm.pdf>, (last visited Jan. 17, 2014).

⁶³ The Technical Working Group for Fire and Explosions (TWGFEX) and the Scientific Working Group for Fire and Explosions (SWGFE) were founded in 1999 by the National Center for Forensic Science at the University of Central Florida and work together to improve fire and explosion laboratory analyses and scene investigations. The mission of TWGFEX is to establish and maintain nationally accepted programs for the forensic investigation of fire, arson and explosion scenes and devices. The mission of SWGFE is to establish and maintain nationally accepted guidelines for fire, arson and explosive laboratory analysts. There are approximately 100 members of SWGFE and TWGFEX at any one time. The membership is broad-ranging, including fire investigators, fire debris analysts and explosive examiners. Members are from the public sector (federal, state, and local representatives) and from the private sector. More information is available at the TWGFEX website, including TWGFEX publications, available at <http://swgfex.org/> (last visited Jan. 17, 2014).

⁶⁴ As a TWGFEX member, Terry-Dawn Hewitt (one of the authors), was one of the TWGFEX representatives who participated in the Inter-agency Working Group (IWG) on Research, Development, Testing, and Evaluation (RDT&E) meeting.

⁶⁵ As of July 18, 2012, the federal government website hosting all of the IWGs, which was in August 2011 at <http://www.forensicscience.gov/iwg.html>, was not available and was shown as “under construction.” This website subsequently disappeared. On November 28, 2012 in a letter to the President of the United States, the Consortium of Forensic Science Organizations expressed concern about the IWGs’ processes because they were not sufficiently funded and their meetings were closed to the public, including members of the forensic science community. (Letter from Bruce A. Goldberger, Ph. D., D-ABFT President *et. al.*, Consortium of Forensic Science Organizations to The President of the United States (Nov. 28, 2012) available at http://www.theiai.org/current_affairs/20121128_WhiteHouse_letter.pdf.) The Consortium of Forensic Science Organizations consists of American Academy of Forensic Sciences, American Society of Crime Laboratory Directors, American Society of Crime Laboratory Directors Laboratory Accreditation Board, International Association for Identification Society of Forensic Toxicologists/ American Board of Forensic Toxicology, and National Association of Medical Examiners. As of January 14, 2014, the authors have not seen the report from the IWGs or the Subcommittee on Forensic Science. However, in the meantime, the U.S. Department of Justice and National Institute of Standards and Technology announced the launch of the new National Commission on Forensic Science.

⁶⁶ *Department of Justice and National Institute of Standards and Technology Announce Launch of National Commission on Forensic Science*, NIST LAW ENFORCEMENT STANDARDS OFFICE (Feb. 15, 2013) <http://www.nist.gov/oles/doj-nist-forensic-science021513.cfm>.

The new initiative provides a framework for coordination across forensic disciplines under federal leadership, with state and local participation. The Department of Justice, through its involvement in the commission, will take an active role in developing policy recommendations and coordinating implementation. The NIST-administered guidance groups will develop and propose discipline-specific practice guidance that will become publicly available and be considered for endorsement by the commission and the Attorney General. This coordinated effort will help to *standardize national guidance for forensic science practitioners*.⁶⁷ [Emphasis added.]

On January 10, 2014, USDOJ and NIST announced the newly appointed members of the Commission. Membership includes a broad representation of experts selected from leaders and stakeholders in the government, forensic science, and legal communities.⁶⁸ Interestingly, of the 30 experts named to the Commission, one is a Co-Director of the Innocence Project,⁶⁹ whose Innocence Network is bringing pressure to bear on faulty fire investigations. Another expert named to the Commission is an esteemed law professor, whose works we cite later in this article as casting a critical eye on reliability issues in arson investigations.⁷⁰

The January 10, 2014 announcement also explains the Commission's mandate, which is as follows:

Members of the commission will work to improve the practice of forensic science by developing guidance concerning the intersections between forensic science and the criminal justice system. The commission also will work to develop policy recommendations for the U.S. Attorney General, including uniform codes for professional responsibility and *requirements for formal training and certification*. [Emphasis added.]⁷¹

It is too early to predict the Commission's new direction, or the effect on fire investigators. However, the official announcements make it clear that high priority goals are to "standardize national

⁶⁷ *Id.*

⁶⁸ *U.S. Departments of Justice and Commerce Name Experts to First-ever National Commission on Forensic Science*, U.S. DEPT. OF JUSTICE, OFFICE OF PUBLIC AFFAIRS (Jan. 10, 2014) <http://www.justice.gov/opa/pr/2014/January/14-at-029.html>.

⁶⁹ The person to which we refer is Peter Neufeld, Co-Director, Innocence Project, Benjamin Cardozo School of Law. While the Innocence Project is concerned with DNA exonerations, members of the Innocence Network (of which the Innocence Project is a founding member), have taken specific aim at wrongful arson convictions.

⁷⁰ Here, we refer to newly appointed Commission member Paul Giannelli, Distinguished University Professor and Albert J Weatherhead III and Richard W. Weatherhead Professor of Law, Case Western Reserve University. *See, e.g.* PAUL C. GIANNELLI, *THE EXECUTION OF CAMERON TODD WILLINGHAM: JUNK SCIENCE, AN INNOCENT MAN, AND THE POLITICS OF DEATH*, (AUGUST 26, 2011) available at http://works.bepress.com/paul_giannelli/2/ [hereinafter GIANNELLI, *EXECUTION OF WILLINGHAM*; and Paul C. Giannelli & Kimberly Gawel, *Arson Evidence*, 47 No. 6 CRIM. LAW BULLETIN ART 8, 8 ("Arson investigations continue to come under attack.").

⁷¹ *U.S. Departments of Justice and Commerce Name Experts to First-ever National Commission on Forensic Science*, U.S. DEPT. OF JUSTICE, OFFICE OF PUBLIC AFFAIRS (Jan. 10, 2014) <http://www.justice.gov/opa/pr/2014/January/14-at-029.html>.

guidance for practitioners in the forensic sciences”⁷² and “set requirements for formal training and certification.”⁷³ Keep these goals in mind when we later consider how *NFPA 921* and *NFPA 1033* dovetail with these goals of the Commission. *NFPA 921* and *NFPA 1033* arguably provide standardized national (and international) guidance for fire investigators, as well as setting requirements for training and certification of fire investigators. More about this later.

To this point in this section, we have outlined the rising concern about wrongful convictions associated with problems in the forensic sciences and some of the steps that government and private sector organizations have taken to identify and deal with these problems. This lays the groundwork for the heart of this article, which is to explain how these developments relate to challenges concerning the reliability and admissibility of expert testimony by fire investigators under *Daubert*, particularly in the context of the continuing development of industry standards that are raising the bar for fire investigators.

Just as the state commissions mentioned earlier⁷⁴ focused on forensic science in a laboratory setting, so did the *NRC/NAS Report*, with one notable exception—it also addressed, albeit briefly, the science behind fire patterns used in fire investigations. This issue is relevant because among the forensic science disciplines that the report addresses are the laboratory analysis of explosives evidence and fire debris. In the context of addressing these disciplines, and after noting that the laboratory analysis of explosives evidence is based on solid scientific foundations, the *NRC/NAS Report* goes on to say:

By contrast, much more research is needed on the natural variability of burn patterns and damage characteristics and how they are affected by the presence of various accelerants. Despite the paucity of research, some arson investigators continue to make determinations about whether or not a particular fire was set. However, according to testimony presented to the committee, many of the rules of thumb that are typically assumed to indicate that an accelerant was used (e.g., “alligatoring” of wood, specific char patterns) have been shown not to be true. Experiments should be designed to put arson investigations on a more solid scientific footing.⁷⁵

It is because of this paragraph that the field of fire investigations is within the scope of the *NRC/NAS Report* and will feel its impact. Until the work of the IWGs is published or the direction to be taken by the new National Commission on Forensic Science is known, it is difficult to predict what future

⁷² *Department of Justice and National Institute of Standards and Technology Announce Launch of National Commission on Forensic Science*, NIST LAW ENFORCEMENT STANDARDS OFFICE (Feb. 15, 2013) <http://www.nist.gov/oles/doj-nist-forensic-science021513.cfm>.

⁷³ *U.S. Departments of Justice and Commerce Name Experts to First-ever National Commission on Forensic Science*, U.S. DEPT. OF JUSTICE, OFFICE OF PUBLIC AFFAIRS (Jan. 10, 2014) <http://www.justice.gov/opa/pr/2014/January/14-at-029.html>.

⁷⁴ *See, e.g.*, the Texas Forensic Science Commission, the California Commission on the Fair Administration of Justice, and the New York State Commission on Forensic Science.

⁷⁵ NRC/NAS REPORT, *supra* note 53, at 172–3 (citations omitted).

changes are in the offing for fire investigations from this end. The *NRC/NAS Report* did not go into detail making specific recommendations concerning fire investigations as it did with some other forensic fields, and the IWGs recommendations are presently unknown. Nonetheless, to a large degree the actions of one of the state commissions on forensic sciences mentioned earlier seems to have set forth the path forward for fire investigators.

4.3. BAD SCIENCE IN FIRE INVESTIGATIONS AND THE TEXAS FORENSIC SCIENCE COMMISSION

While the state commissions on forensic science were set up largely to address the problems in crime labs rather than crime scene investigations, the authority granted to the Texas Forensic Science Commission (TFSC) was cast more broadly.⁷⁶ Consequently, serious problems with fire and arson investigations the fire investigation community had clearly known for well over a decade, but to a significant extent ignored, were exposed publically due to the combined efforts of the Innocence Network and the TFSC. These developments are important to our premise of the rising storm for fire investigators, therefore we will briefly elucidate.

One aspect of a fire investigator's job involves examining physical evidence at the scene and drawing inferences from the heated or burned debris. Materials exposed to fire undergo changes that investigators can see or sometimes measure. Such changes are called, "fire effects."⁷⁷ For example, wood chars, metal and plastics melt, glass cracks and breaks, and material changes color or is covered in soot. At an elementary level, these are examples of fire effects. When a recognizable configuration of such effects is discernible, investigators call it a fire pattern,⁷⁸ or sometimes, a burn pattern. Part of the duties of a fire investigator is to study and interpret the meaning of fire effects and patterns, drawing inferences about the initiation and development of the fire, eventually identifying its area of origin and cause.

Interpreting fire patterns can be a very time consuming and complex endeavor. The scientific knowledge base behind the interpretation of fire patterns continues to develop and inroads have been made into the inferences that reliably can be drawn from indicators at a fire scene. This growing knowledge base has also uncovered falsehoods, so-called rules of thumb concerning conclusions that have been drawn from data at fire scenes that have proven to be wrong. Many of these rules of thumb were used to identify fire patterns or fire effects at fire scenes that were believed to indicate an incendiary fire, indicative of arson. Examples are alligator charring of wood (evident by large shiny blisters), collapsed furniture or bed springs, circular or irregular burn patterns, and narrow "V" patterns, all of which were said to be caused by the use of a liquid

⁷⁶ Tex. Forensic Sci. Comm'n, *supra* note 48.

⁷⁷ NAT'L FIRE PROT. ASS'N TECHNICAL COMM. ON FIRE INVESTIGATIONS, NFPA 921 GUIDE FOR FIRE AND EXPLOSION INVESTIGATIONS [hereinafter NFPA 921] §§ 6.1.1. (2014 ed.), ("Fire effects are the observable or measurable changes in or on a material as a result of exposure to the fire.")

⁷⁸ NFPA 921, *supra* note 77, 2014 ed., at §§ 3.3.68 (definition of Fire Patterns, "The visible or measurable physical changes, or identifiable shapes, formed by a fire effect or group of fire effects.").

accelerant, making the fire burn hotter and faster than what was considered normal, therefore signifying an incendiary fire.

Two decades ago, these and other rules of thumb that had long been used by fire investigators were flatly denounced. In 1992, the first edition of *NFPA 921 Guide for Fire and Explosion Investigations* (*NFPA 921*) was published by the National Fire Protection Association (NFPA), tackling head-on these rules of thumb, calling them “misconceptions.” The NFPA is an international standards-making organization and the *NFPA 921 Guide* is a widely disseminated, consensus industry standard published by the NFPA. At the time of the 1992 publication, the technical committee responsible for *NFPA 921* included members from government organizations, as well as national and international trade associations representing the fire investigation community. Other publications issued in the same period likewise questioned the scientific underpinnings of such rules of thumb.⁷⁹

Over time, revisions to *NFPA 921* have added to the original list of misconceptions, cautioning investigators about unreliable fire scene indicators. For example, since a Tentative Interim Amendment to the 1995 edition of *NFPA 921*, which was passed in 1996, there has been a clear warning about canine alerts that are not confirmed by laboratory analysis:

9-5.3.4* Canine Teams. Properly trained and validated ignitable liquid detection canine/handler teams have proven their ability to improve fire investigations by assisting in the location and collection of samples for laboratory analysis for the presence of ignitable liquids. The proper use of detection canines is to assist with the location and selection of samples.

In order for the presence or absence of an ignitable liquid to be scientifically confirmed in a sample, that sample should be analyzed by a laboratory in accordance with [the section on collecting forensic physical evidence]. Any canine alert not confirmed by laboratory analysis *should not be considered validated*. [Emphasis added.]⁸⁰

This wording has survived into the current 2014 edition. Further language was added in the 2008 edition to add information about research showing that canines sometimes alert to “pyrolysis⁸¹ products that are not produced by an ignitable liquid and have not always alerted when an ignitable

⁷⁹ See, e.g., J. J. Lentini, *Lime Street Fire: Another Perspective*, FIRE AND ARSON INVESTIGATOR Vol. 43 No. 1, 52 (September 1992) (reviewing evidence of a fire in Jacksonville, FL, and summarizing the results of test fires set in homes identical to the one at issue, concluding that the burn patterns were consistent with both an accidental scenario and an arson fire in which a liquid accelerant was used); J. J. Lentini, D. M. Smith, et al., *Unconventional Wisdom: The Lessons of Oakland*, FIRE AND ARSON INVESTIGATOR Vol. 43 No. 4, (June 1993) (challenging the validity of fire scene artifacts such as crazed glass and melted metal found in total burns or “black holes,” as indicators of fire of incendiary origin); J. J. Lentini, *Behavior of Glass at Elevated Temperatures*, JOURNAL OF FORENSIC SCIENCES Vol. 37 No. 5, 1358 (September 1992) (questioning the widely held belief that crazed glass results from rapidly increasing temperature consistent with an accelerated fire, and concluding instead that glass crazes from rapidly decreasing temperature).

⁸⁰ NFPA 921, *supra* note 77, 1998 ed., at §§ 9-5.3.4*.

⁸¹ NFPA 921, *supra* note 77, 2014 ed., at §§ 3.3.139 (“Pyrolysis. A process in which material is decomposed, or broken down, into simpler molecular compounds by the effects of heat alone; pyrolysis often precedes combustion.”)

liquid accelerant was known to be present.”⁸² Additional paragraphs go on to outline the research that shows canine alerts that are not confirmed by laboratory analysis are unreliable as evidence of the presence of an ignitable liquid accelerant.⁸³

Another example is the caution that appeared in *NFPA 921*, 2004 edition, and continues into the current edition, instructing investigators not to use the phrase “pour pattern,” which is misleading, and that an inference that an ignitable liquid was used should be confirmed by laboratory analysis:

6.17.8.2.5 The term *pour pattern* implies that a liquid has been poured or otherwise distributed, and therefore, is demonstrative of an intentional act. Because fire patterns resulting from burning ignitable liquids are not visually unique, the use of the term *pour pattern* and reference to the nature of the pattern should be avoided. The correct term for this fire pattern is an *irregularly shaped fire pattern*. The presence of an ignitable liquid should be confirmed by laboratory analysis. The determination of the nature of an irregular pattern should not be made by visual interpretation of the pattern alone.⁸⁴

These and later studies that were published and are available industry-wide⁸⁵ warned about fire scene indicators or investigation techniques that lack scientific validity. Unfortunately, these publications have not stopped some investigators from using these indicators as evidence for the prosecution as expert witnesses at trials of arson crimes or for insurance companies denying claims based on the insured having committed arson. The practice of using these disproven indicators as evidence of arson has continued as is evident from case decisions.⁸⁶ Even the threat of a challenge under *Daubert* or its state offshoots, in addition to the repeated cautions in *NFPA 921* about relying

⁸² NFPA 921, *supra* note 77, 2008 ed., at sub-para. 16.5.4.7.2*.

⁸³ NFPA 921, *supra* note 77, 2008 ed., at sub-paras.16.5.4.7.3–16.5.4.7.6.

⁸⁴ NFPA 921, *supra* note 77, 2004 ed., at sub-para. § 6.17.8.2.5.

⁸⁵ See, e.g., JAMES H. SHANLEY, JR., USFA FIRE BURN PATTERNS TESTS: REPORT OF THE UNITED STATES FIRE ADMINISTRATION PROGRAM FOR THE STUDY OF FIRE PATTERNS (United States Fire Administration, 1997); ANTHONY D. PUTORTI, JR. *ET.AL.*, FLAMMABLE AND COMBUSTIBLE LIQUID SPILL/BUM PATTERNS, (Nat’l Inst. of Justice, 2001).

⁸⁶ See, e.g., *People v. Smith*, 253 Ill.App.3d 443, 624 N.E.2d 836, 191 Ill.Dec. 648 (1993) (affirming defendant’s conviction of arson: “[The expert] based his conclusions [that the fire was incendiary] on having discovered deep charring patterns, or “alligatoring,” on the floor of the kitchen and his belief that only a deliberately set fire could have erupted so quickly from the time the last employees left the restaurant and the “fast, hot fire” was detected. No trace of accelerant was detected by laboratory tests. [The expert] testified that he conducted a thorough investigation of the fire scene and eliminated all other possible causes and sources of the fire.”); *Nobel v. State*, 2002 WL 575724 (Tex. App. 2002) (not designated for publication) (arson investigators found pour patterns, melted aluminum and heavy burn areas consistent with the use of accelerants, but testimony by one expert that there was evidence of “flash-back” consistent with the use of an accelerant was ruled hearsay and not admissible); *B. Bennett Manufacturing Co. Inc. v. So Carolina Ins. Co.*, 692 So.2d 1258, 96-731 (La. App. 5 Cir. 1997) (arson investigator concluded area of origin of fire was in area of heavy spalling indicating an accelerant had been poured). In terms of the use of evidence from canine alerts, see *State v. Schultz* 58 P.3d 879 (UT App. 2002), *Commonwealth v. Crouse*, 447 Mass. 558 (2006), and *Yell v. Commonwealth*, 242 S.W.3d 331 (KY 2007), all of which deal with canine alerts unconfirmed by laboratory analysis that were included in the investigators’ evidence and resulted in convictions that were upheld on appeal.

on these misconceptions, has not stopped some investigators from using these as data in their investigations and relying on them as evidence in expert witness testimony.⁸⁷

However, like a little snowball rolling down a mountain gaining momentum and size, the outcry against this bad science has grown louder and is spreading. Word eventually reached beyond the fire investigation community through concerns raised by the Innocence Project about two men convicted of arson, Cameron Todd Willingham and Ernest Ray Willis. Here is the summary from the Innocence Project website:

Cameron Todd Willingham . . . was convicted in 1992 of setting a fire to his Corsicana, Texas, house in 1991 that killed his three daughters. Four years earlier, Ernest Ray Willis . . . was sentenced to death for setting a fire that killed two women in Iraan, Texas. Both men claimed that they were innocent of the murders. Similar arson investigations—including “scientific” methods that have been debunked—led to both convictions. But the two cases reached very different conclusions in 2004. Willingham was executed by lethal injection on February 17, 2004. On October 6 of the same year, Willis was freed after a state judge heard new evidence pointing to his innocence and threw out his conviction.⁸⁸

The Innocence Project subsequently commissioned a report by independent experts to peer review the expert testimony in these two cases, which concluded that neither of the fires was of incendiary origin.⁸⁹ This report, delivered in 2006, determined that the prosecution experts in these cases believed their testimony to be truthful. However, their conclusions were wrong because they relied on interpretations of indicators at the fire scenes that are based on invalid science: “To the extent that there are still investigators in Texas and elsewhere, who interpret low burning, irregular fire patterns, and collapsed furniture springs as indicators of incendiary fires, there will continue to be serious miscarriages of justice.”⁹⁰ One of the main recommendations coming out of the report was that to prevent future miscarriages of justice, “individuals conducting investigations of fire incidents must be provided with fundamental scientific knowledge of the physics and chemistry of fire as a

⁸⁷ See, e.g., Expert Report and Aff. at paras. 4–9, *Wohlers v. Farm Bureau Mut. Ins. Co.*, No. 07-CV-03891-PJS-RLE (D. Minn. 2008), 2008 WL 5740024, (defendant insurer’s fire expert testifying to “a reasonable degree of certainty” that fire was incendiary based on eliminating accidental causes and patterns on the floor indicative of liquid pour pattern and that “severe and low burn damage is strong evidence there was an accelerant present,” but no mention made that there was laboratory confirmation of the presence of an ignitable liquid); Expert Report and Aff. at 8-11, *Capitol Communications, Inc. v. Secura Ins.*, No. 1:10CV01148 (W.D. Mich. March 7, 2010), 2010 WL 8523021 (affidavit of plaintiff’s expert in action against defendant insurer refuting evidence of plaintiff’s fire experts that the was incendiary based in part on low burn, irregular floor patterns, severe burn intensity and canine alert with no laboratory confirmation).

⁸⁸ *News and Information, Improving Forensics to End Injustice*, INNOCENCEPROJECT.ORG, http://www.innocenceproject.org/Content/Improving_forensics_to_end_injustice.php (last visited Jan. 17, 2014).

⁸⁹ INNOCENCE PROJECT ARSON REVIEW COMM., REPORT ON THE PEER REVIEW OF THE EXPERT TESTIMONY IN THE CASES OF *STATE OF TEXAS V. CAMERON TODD WILLINGHAM* AND *STATE OF TEXAS V. ERNEST RAY WILLIS* (2006), available at <http://www.innocenceproject.org/docs/ArsonReviewReport.pdf> [hereinafter ARSON REVIEW REPORT].

⁹⁰ *Id.* at 3.

prerequisite for the practical application of fire dynamics within the context of the Scientific Method.”⁹¹

Further, the report urged additional action, including:

- Education of both defense and prosecuting attorneys,
- The use of court-appointed independent experts to evaluate the prosecution’s evidence of arson,
- Laboratory confirmation of fire debris from irregular burn patterns thought to be caused by ignitable liquids,
- Careful analysis of positive lab results to ensure the residues were not from substances naturally occurring in the materials present before the fire, and;
- Changes to the way the justice system responds to newly discovered evidence (such as evolving scientific knowledge) in wrongful conviction arson cases.⁹²

On the strength of this report, the Innocence Project applied to have the TFSC investigate these two cases and make recommendations to address the problems with arson investigations apparent from the review of these cases.⁹³ TFSC agreed to undertake the investigation and hired Dr. Craig Beyler to conduct an expert review of the fire investigations conducted in these two cases and compare them with the standard of care for fire investigations and knowledge base respecting fire science at the time of these investigations and at the time of TFSC’s review.⁹⁴ Dr. Beyler submitted his report in August 2009 (the *Beyler Report*), in which he concluded:

The investigations of the Willis and Willingham fires did not comport with either the modern standard of care expressed by NFPA 921, or the standard of care expressed by fire investigation texts and papers in the period 1980–1992. The investigators had poor understandings of fire science and failed to acknowledge or apply the contemporaneous understanding of the limitations of fire indicators. Their methodologies did not comport with the scientific method or the process of elimination. A finding of arson could not be sustained

⁹¹ *Id.* at 40.

⁹² *Id.* at 40–41.

⁹³ TEX. FORENSIC SCI. COMM’N, FINAL REPORT WILLINGHAM/WILLIS INVESTIGATION 8-9 (April 15, 2011), available at <http://www.fsc.state.tx.us/documents/FINAL.pdf> [hereinafter TFSC FINAL REPORT] (in 2008, “the Innocence Project filed a formal complaint with the FSC alleging professional negligence and/or misconduct in the course of the arson investigations and testimony given” in the Willingham and Willis cases).

⁹⁴ Letter from Tex. Forensic Sci. Comm’n to Craig Beyler, Jan. 20, 2009, *id.* at Ex. 8.

based upon the standard of care expressed by NFPA 921, or the standard of care expressed by fire investigation texts and papers in the period 1980–1992.⁹⁵

On April 15 2011, TFSC completed its report on its investigation (*TFSC Final Report*), submitting 17 recommendations “intended to be applicable to fire investigations statewide.”⁹⁶ These recommendations include:

- “Adoption of National Standards”: requiring fire investigators to “adhere to the standards of *NFPA 921*.” Even though there were no plans to accredit fire investigation agencies, the TFSC also proposed investigators pursue one benefit of accreditation, which is to create “a strategic plan setting forth best practices in fire investigation,” which meets current “recommended national standards” such as “the current edition of *NFPA 921*, *NFPA 1033* [*Standard for Professional Qualifications for Fire Investigator (NFPA 1033)*], the National Institute of Justice’s June 2000 report entitled *Fire and Arson Scene Evidence: A Guide for Public Safety Personnel . . .*; and the National Center for Forensic Science (Carl Chasteen), and Technical/Scientific Working Group’s January 2008 report entitled *Fire and Explosion Investigations and Forensic Analyses: Near-and Long-Term Needs Assessment for State and Local Law Enforcement*.”⁹⁷
- “Retroactive Review”: Through re-examining cases when developments in science may materially affect the original conclusion.⁹⁸
- “Enhance Certification”: Requiring, over time, that all investigators comply with *NFPA 1033*, in particular the knowledge base and continuing education requirements including the “list of 13” in paragraphs 1.3.7 and 1.3.8.⁹⁹

⁹⁵ CRAIG L. BEYLER, ANALYSIS OF THE FIRE INVESTIGATION METHODS AND PROCEDURES USED IN THE CRIMINAL ARSON CASES AGAINST ERNEST RAY WILLIS AND CAMERON TODD WILLINGHAM (August, 2009), *reprinted in* TEX. FORENSIC SCI. COMM’N, FINAL REPORT WILLINGHAM/WILLIS INVESTIGATION Ex. 7 (April 15, 2009), *available at* <http://www.fsc.state.tx.us/documents/FINAL.pdf>.

⁹⁶ TFSC FINAL REPORT, *supra* note 93, at 39.

⁹⁷ TFSC FINAL REPORT, *supra* note 93, at 39–40.

⁹⁸ TFSC FINAL REPORT, *supra* note 93, at 41.

⁹⁹ TFSC Final Report, *supra* note 93, at 43–44, *citing* NAT’L FIRE PROT. ASS’N TECHNICAL COMM. ON FIRE INVESTIGATOR PROFESSIONAL QUALIFICATIONS, *NFPA 1033 STANDARD FOR PROFESSIONAL QUALIFICATIONS FOR FIRE INVESTIGATOR* §§ 1.3.7-1.3.8 (2009 ed.). The “list of 13” mentioned in this recommendation are contained in section 1.3.8 of the 2009 edition of *NFPA 1033*, which provides, “The investigator shall have and maintain at a minimum an up-to-date basic knowledge of the following topics beyond the high school level: at a post-secondary education level: (1) Fire science, (2) Fire chemistry, (3) Thermodynamics, (4) Thermometry, (5) Fire dynamics, (6) Explosion dynamics, (7) Computer fire modeling, (8) Fire investigation, (9) Fire analysis, (10) Fire investigation methodology, (11) Fire investigation technology, (12) Hazardous materials, (13) Failure analysis and analytical tools.” For information on the proposed amendments to the list of 13, see the discussion in Part II of this article.

- “Collaborative Training on Incendiary Indicators”: Including the development and implementation of trainings and live burn exercises, requiring at a minimum coverage of a list of topics including fire science basics, incendiary indicators, myths and misconceptions, and elimination of accidental causes.¹⁰⁰
- “Standards for Testimony in Arson Cases” and “Enhanced Admissibility Hearings in Arson Cases”: Requiring investigators follow *NFPA 1033* in testimony and that *Daubert/Kelly*¹⁰¹ admissibility hearings be conducted in arson cases, to be aggressively pursued by prosecutors and defense counsel, to help ensure the scientific testimony is both relevant and reliable.¹⁰²
- “Minimum Report Standards”: That minimum reporting standards are used to help ensure that investigators are following the scientific method in accordance with *NFPA 921*. In this recommendation, the TFSC echoed the sentiments of the *NRC/NAS Report* that there is a “critical need . . . to raise the standards for reporting and testifying about the results of investigations.”¹⁰³
- “Training for Lawyers/Judges”: That those responsible for overseeing the education of lawyers and judges involved in criminal justice require ongoing forensic science training.¹⁰⁴

Interestingly, these recommendations mirror many of those in the *NRC/NAS Report*, which was “recognized and applauded” by the TFSC.¹⁰⁵ When read together, the *TFSC Final Report* and the *NRC/NAS Report* provide a roadmap for the path forward in fire investigations.

The work of the TFSC respecting the Willingham and Willis cases came to an abrupt halt later in 2011 when the Texas Attorney General issued an opinion stating that the TFSC did not have jurisdiction respecting evidence collected or offered in court before September 1, 2005. Further, its jurisdiction does not extend beyond accredited laboratories, facilities, and entities of the Texas

¹⁰⁰ TFSC Final Report, *supra* note 93, at 45.

¹⁰¹ This reference is to the unanimous decision of the California Supreme Court in *People v. Kelly* 549 P.2d 1240 (Cal. 1976), which explored the admissibility of expert witness testimony based on novel scientific evidence, setting forth the tests to be used in determining the reliability and confirming the general acceptance test proffered in *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923). In 1994, the California Supreme Court rendered its decision in *People v. Leahy* 882 P.2d 321 (Cal. 1994), considering but declining to adopt the approach set forth in *Daubert*, and reaffirming the *Kelly/Frye* rule. Texas follows a modified version of the *Daubert* decision.

¹⁰² TFSC FINAL REPORT, *supra* note 93, at 48–49.

¹⁰³ TFSC FINAL REPORT, *supra* note 93, at 49, *citing* the NRC/NAS REPORT, *supra* note 53, at 185.

¹⁰⁴ TFSC FINAL REPORT, *supra* note 93, at 51.

¹⁰⁵ *National Academy of Sciences Report Page*, TEX. FORENSIC SCI. COMM’N, available at: <http://www.fsc.state.tx.us/nas-report/> (last updated March, 2009).

Department of Public Safety.¹⁰⁶ Thus, TFSC issued an addendum report in October, 2011 (*TFSC Addendum Report*) stating that it would not be issuing any findings respecting the allegations of negligence or misconduct of the fire officials involved in these cases or the Texas State Fire Marshal's office (SFMO). Notwithstanding that the jurisdiction and authority of the TFSC in dealing with these cases was found lacking, the *TFSC Addendum Report* contained the following statement about the future of the recommendations in its *Final Report*:

The SFMO considers the [T]FSC's 17 recommendations to be appropriate and fair. The SFMO is committed to ensuring the best possible forensics are used in fire investigations in Texas. The SFMO will consult with credible organizations, seek expert advice and coordinate with the [T]FSC to implement the recommendations.¹⁰⁷

The *TFSC's Addendum Report* goes on to summarize all of its recommendations, together with the action the SFMO is taking on each one. Together the *NRC/NAS Report* and the two TFSC reports place considerable weight on the need for certification and complying with industry standards. In terms of the field of fire investigations, TFSC makes it clear that *NFPA 921* and *NFPA 1033* are industry standards that fire investigators must follow, at least in Texas.

The authors expect other states and the federal government to follow suit. Oklahoma's State Senate, for example, is one of the leaders in raising the bar for fire investigators in arson cases, having in March, 2010 passed *A Resolution Acknowledging Obligation to Review Convictions; Urging a Review of Questionable Convictions; Supporting Judicial Review; Urging Use of NFPA 921; and Directing Distribution*,¹⁰⁸ which provides, in part:

That the Oklahoma State Senate acknowledges that the government has an obligation to review arson convictions obtained using evidence that is now known to be unreliable.

That the Oklahoma State Senate urges that government attorneys and private attorneys and fire investigators review questionable arson convictions.

That the Oklahoma State Senate supports judicial review of any cases where attorneys submit that a conviction is questionable due to faulty science having been used.

That the Oklahoma State Senate urges the judicial branch, law enforcement agencies, and other relevant government entities in Oklahoma to employ NFPA 921 when conducting fire investigations.

NFPA 921 and *NFPA 1033* are inextricably linked, and while the latter standard has received less attention by the courts, both are critically important to the future of fire investigations. While we

¹⁰⁶ TEX. FORENSIC SCI. COMM'N, ADDENDUM TO THE APRIL 15, 2011 REPORT 3 (Oct. 28, 2011), available at http://www.innocenceproject.org/docs/2011/Willingham_Willis_Addendum_2011.pdf [hereinafter *TFSC ADDENDUM REPORT*].

¹⁰⁷ *Id.* at 5.

¹⁰⁸ S.R. 99, (Okla. 2010), available at <https://www.sos.ok.gov/documents/legislation/52nd/2010/2R/SR/99.pdf>.

have written extensively elsewhere about these two standards and their use in court,¹⁰⁹ the next section of this article reviews them briefly, particularly in light of significant revisions in the 2014 editions of each document that the NFPA is publishing.

5. THE THIRD FORCE: ONGOING REVISIONS OF STANDARDS THAT RAISE THE BAR FOR FIRE INVESTIGATORS

In the previous section, we explained how the growing apprehension about wrongful convictions stemming from faulty forensic evidence has resulted in five publications that are of particular importance to fire investigators:

- 1) The *Arson Review Report*¹¹⁰ commissioned by the Innocence Project¹¹¹ to peer review the expert testimony in the death penalty cases of Cameron Todd Willingham and Ernest Ray Willis, both convicted in Texas of arson crimes.
- 2) A report prepared by Dr. Craig Beyler in August, 2009¹¹² (the *Beyler Report*), commissioned by the Texas Forensic Science Commission¹¹³ (TFSC) in the course of its investigation into the debunked fire science that caused Willingham and Willis to be convicted of arson.

¹⁰⁹ See, e.g., *Hewitt & McKenna, supra.* at note 12.

¹¹⁰ INNOCENCE PROJECT ARSON REVIEW COMM., REPORT ON THE PEER REVIEW OF THE EXPERT TESTIMONY IN THE CASES OF *STATE OF TEXAS V. CAMERON TODD WILLINGHAM* AND *STATE OF TEXAS V. ERNEST RAY WILLIS* (2006), available at <http://www.innocenceproject.org/docs/ArsonReviewReport.pdf> [hereinafter ARSON REVIEW REPORT].

¹¹¹ *Mission Statement*, InnocenceProject.org, <http://www.innocenceproject.org/about/Mission-Statement.php> (last visited Jan. 17, 2014) (“[A]n independent nonprofit organization closely affiliated with Cardozo School of Law at Yeshiva University, the Innocence Project’s mission is nothing less than to free the staggering numbers of innocent people who remain incarcerated and to bring substantive reform to the system responsible for their unjust imprisonment.”).

¹¹² CRAIG L. BEYLER, ANALYSIS OF THE FIRE INVESTIGATION METHODS AND PROCEDURES USED IN THE CRIMINAL ARSON CASES AGAINST ERNEST RAY WILLIS AND CAMERON TODD WILLINGHAM (August, 2009), reprinted in TEX. FORENSIC SCI. COMM’N, FINAL REPORT WILLINGHAM/WILLIS INVESTIGATION Ex. 7 (April 15, 2009), available at <http://www.fsc.state.tx.us/documents/FINAL.pdf>.

¹¹³ *About Us*, TEX. FORENSIC SCI. COMM’N (2012) <http://fsc.state.tx.us/about/>. The Texas Forensic Science Commission was established in 2005. It “investigates complaints that allege professional negligence or misconduct by a laboratory, facility or entity that has been accredited by the Director of the Texas Department of Public Safety that would substantially affect the integrity of the results of a forensic analysis. The term ‘forensic analysis’ means a medical, chemical, toxicological, ballistic, or other examination or test performed on physical evidence, including DNA evidence, for the purpose of determining the connection of the evidence to a criminal action.” *Id.*

- 3) A groundbreaking work on problems in forensic science prepared by the National Academy of Sciences in 2009, *Strengthening Forensic Science in the United States: A Path Forward*¹¹⁴ (the *NRC/NAS Report*), which briefly alludes to the same faults plaguing fire investigations that are discussed in detail by both the *Arson Review Report* and the *Beyler Report*.
- 4) A report prepared in April 2011 by the TFSC on the Willingham and Willis cases (TFSC Final Report) that puts forward copious and substantial recommendations to improve fire investigations.¹¹⁵
- 5) A follow-up report prepared by the TFSC in October, 2011 (TFSC Addendum Report) indicating that the Texas State Fire Marshal's Office approved their earlier recommendations and is taking action on each of the recommendations in the TFSC Final Report.¹¹⁶

All of these reports have recommendations to remedy the problems with faulty forensic sciences and minimize the consequent risk of injustice. Every one of them also emphasizes the need for adequate standards for forensic disciplines and sufficient training for practitioners within each field. It is in the context of this call for the development and application of standards for fire investigations that we begin this section.

This section first introduces *NFPA 1033* and *NFPA 921* in relation to each other and to the *Daubert* reliability criteria. Next is an overview of the nature of the changes in the new, 2014 editions of *NFPA 1033* and *NFPA 921* that the NFPA has published. With these changes, stronger connections have been forged between *NFPA 1033* and *NFPA 921*, which will have remarkable implications for using them in court. We explain the nature of these connections and their implications for courtroom advocacy. Finally, we pose and answer the question, "So what?" *NFPA 1033* and *NFPA 921* have been around for decades during which the NFPA's regulations have subjected them to regular revision cycles. Why now do we anticipate that these documents will have a heightened role in the coming storm?

5.1. QUICK OVERVIEW OF *NFPA 1033* AND *NFPA 921* AND THEIR RELATION TO *DAUBERT'S* RELIABILITY FACTORS

NFPA 1033 is a mandatory standard, setting forth the qualifications required to perform the job of a fire investigator in either the public or private sectors. *NFPA 1033* establishes job performance requirements that are used to measure whether a person has the skills and knowledge to perform

¹¹⁴ COMM. ON IDENTIFYING THE NEEDS OF THE FORENSIC SCI. CMTY. *ET AL.*, NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., *STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD* (2009), available at <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf> [hereinafter *NRC/NAS REPORT*].

¹¹⁵ TEX. FORENSIC SCI. COMM'N, *FINAL REPORT WILLINGHAM/WILLIS INVESTIGATION* (April 15, 2009), available at <http://www.fsc.state.tx.us/documents/FINAL.pdf> [hereinafter *TFSC FINAL REPORT*].

¹¹⁶ TEX. FORENSIC SCI. COMM'N, *ADDENDUM TO THE APRIL 15, 2011 REPORT* (Oct. 28, 2011), available at http://www.innocenceproject.org/docs/2011/Willingham_Willis_Addendum_2011.pdf [hereinafter *TFSC ADDENDUM REPORT*].

the various duties required of a fire investigator. Fire investigator certification programs such as those put in place by the International Association of Arson Investigators¹¹⁷ and the National Association of Fire Investigators¹¹⁸ comply with *NFPA 1033*'s requirements and are designed to help investigators conform to this standard. *NFPA 1033* is important for several reasons, including its relevance to employers in determining if a person is sufficiently qualified to investigate fires. It is also serves as a tool for attorneys and judges in civil and criminal litigation to evaluate the qualifications of a person proposing to testify as an expert.

NFPA 1033 defines the knowledge base and skills a fire investigator must possess. However, it does not contain the information necessary for investigators to build their knowledge base, nor does it describe how investigators must perform the required skills. Instead, it provides the template for each job performance requirement, and then points investigators to other sources where they can acquire the knowledge and skills *NFPA 1033* requires. This is where *NFPA 921* comes in. *NFPA 1033* specifically cites *NFPA 921* as one of the primary information sources for the required knowledge, and for the methods of executing many of the mandatory skills.¹¹⁹ Thus, for example, where *NFPA 1033* requires the fire investigator to have a basic knowledge of fire science, it explicitly points to *NFPA 921* as a source of this knowledge.¹²⁰

In terms of how experts and attorneys use these documents in court, both documents are relevant to challenging the qualifications of fire investigators. Further, *NFPA 921* has received substantial attention from courts in deciding reliability challenges because it pairs so neatly with the *Daubert* factors. Briefly, below is a summary of how *NFPA 921* is relevant to four of the five *Daubert* factors:¹²¹

¹¹⁷ *About IAAI*, INT'L ASS'N OF ARSON INVESTIGATORS (2014), <http://firearson.com/about>. The IAAI, is a voluntary membership association of "more than 5,000 fire investigation professionals from across the world, united by a strong commitment to suppress the crime of arson through professional fire investigation." *Id.* It encourages and "supports professional standards for fire investigators," *id.*, as well as professional qualifications through training and its certification programs for fire investigators and related professionals.

¹¹⁸ *About NAFI*, NAT'L ASS'N OF FIRE INVESTIGATORS (2014), <http://www.nafi.org/about/>. NAFI is a voluntary membership association of fire investigators "dedicated to the education of fire investigators worldwide," with a wide variety of educational programs based on *NFPA 921*, as well as certification programs based on *NFPA 921* and *NFPA 1033*. (<http://www.nafi.org/certification/index.cfm>).

¹¹⁹ *NFPA 1033* (2014 ed.), *supra* note 10, §§ A.1.3.7, A.1.3.8, A.3.3.13.2, A.4.1.2, A.4.2.2, C.1.1. See generally Int'l Ass'n of Arson Investigators, *Fire and Explosion Investigations: Utilizing NFPA 1033 and 921* (2008), CFITRAINER.NET, <http://www.cfitrainer.net/> ((login required) follow "[Fire and Explosion Investigations: Utilizing NFPA 1033 and 921](#)"; then follow "launch program" hyperlink) (describing the relationship between *NFPA 1033* and *NFPA 921* and how to utilize them in a fire investigation); Int'l Ass'n of Arson Investigators, *The Practical Application of the Relationship Between NFPA 1033 and NFPA 921* (2012), CFITRAINER.NET, <http://www.cfitrainer.net/> ((login required) follow "[The Practical Application of the Relationship Between NFPA 1033 and NFPA 921](#)"; then follow "launch program" hyperlink) (explaining the relationship between *NFPA 1033* and *NFPA 921*).

¹²⁰ *NFPA 1033* (2014 ed.), *supra* note 10, at §§ 1.3.7–1.3.8.

¹²¹ TERRY-DAWN HEWITT & WAYNE J. MCKENNA, *NFPA 921 AND NFPA 1033 IN COURT* 10–11 (Oct. 2008), <http://www.cfitrainer.net/> ((login required) follow "[Fire and Explosion Investigations: Utilizing NFPA 1033 and 921](#)";

- **Testing:** *Daubert* asks if the fire expert's theory or technique can be tested. In the "Basic Methodology" chapter, *NFPA 921* describes cognitive testing as part of the scientific method. Further, *NFPA 921* describes a number of situations where laboratory or field tests are available that investigators or other experts may conduct. An investigator can use the *NFPA 921* recommendations to address this *Daubert* factor. Conversely, where *NFPA 921* outlines tests that an investigator could have conducted but did not, an attorney can use the failure to conduct relevant testing to contest the reliability of an expert's conclusions.¹²²
- **Peer Review and Publication:** *Daubert* asks whether the theory or technique relied on by the fire expert has been subjected to peer review or publication. There is a strong argument that the standards development process through which *NFPA 921* was developed constitutes peer review and publication. Therefore, an expert who follows *NFPA 921* is applying peer reviewed and published methodologies, theories, and techniques. For example, in *Travelers Property & Casualty Corp. v. General Electric Co.*,¹²³ the court called *NFPA 921* "a peer reviewed and generally accepted standard in the fire investigation community," thus recognizing its peer reviewed component.
- **Standards:** *Daubert* asks whether standards that control the operation of the technique used by the fire expert exist and are maintained. Again, the standards-development process underlying the creation of *NFPA 921* comes into play. *NFPA 921* is an American National Standards Institute¹²⁴ (ANSI) standard.¹²⁵ In an oft-quoted case, *McCoy v. Whirlpool*,¹²⁶ the court said, "The 'gold standard' for fire investigations is codified in *NFPA 921*, and its testing methodologies are well known in the fire investigation community and familiar to the courts."¹²⁷
- **General Acceptance:** *Daubert* asks whether the relevant scientific community generally accepted the theory or technique used by the fire expert? There is a significant consensus

then follow "launch program" hyperlink; then follow "Reading List" hyperlink; then follow "[NFPA 921 and NFPA 1033 In Court](#)" hyperlink).

¹²² See, e.g., *Fireman's Fund Ins. Co. v. Canon U.S.A., Inc.*, 394 F.3d 1054 (8th Cir. 2005).

¹²³ 150 F.Supp. 2d 360, 366 (D. Conn. 2001).

¹²⁴ ANSI, *About ANSI Overview*, ANSI.ORG, http://www.ansi.org/about_ansi/overview/overview.aspx?menuid=1 (last visited Jan. 17, 2014). ANSI is the official representative of the United States to the International Standards Organization (ISO). It oversees the promulgation of American National Standards. *Id.*

¹²⁵ See, e.g., *NFPA 921* (2011 ed.), *supra* note 9, at 1 ("This edition of *NFPA 921* was approved as an American National Standard on January 3, 2011."). As at the time of writing (January, 2014), *NFPA 921* 2014 ed. was not yet published and was not yet shown on the ANSI website as an ANSI standard, but the authors expect it to be approved as an ANSI standard, just as the previous editions.

¹²⁶ 214 F.R.D. 646 (D. Kan. 2003).

¹²⁷ *McCoy v. Whirlpool Corp.*, 214 F.R.D. 646, 653 (D. Kan. 2003).

building aspect in the standards-development process utilized to develop *NFPA 921*.¹²⁸ This aspect lends itself to establishing that the information it contains in its current edition represents the general consensus of the fire investigation community and is therefore generally accepted.¹²⁹

It is because of these parallels between the *Daubert* factors and *NFPA 921* that attorneys and judges since the mid-1990s have used *NFPA 921* in hundreds of cases in federal and state courts to measure the reliability of fire experts' opinions. The only *Daubert* factor that *NFPA 921* does not directly address is the "known or potential rate of error" as it is relevant to fire investigations. Arguably, error rates are only relevant when evaluating the reliability of forensic testing instruments¹³⁰ such as those used in laboratory analysis of fire debris or explosive residues. To the extent that error rates are available for forensic testing, a good place to start in researching these error rates is by reviewing the publications listed in the *Referenced Publications* chapter¹³¹ and other publications in *NFPA 921* that deal with such tests.¹³²

5.2.CHANGES IN THE 2014 EDITION OF *NFPA 1033* AND THEIR IMPLICATIONS IN COURT

Both *NFPA 1033* and *NFPA 921* are products of NFPA's standards-development process, which requires that they be reviewed and revised if necessary at least every five years. To date, *NFPA 1033* has been on a five-year revision cycle since its first publication.¹³³ *NFPA 921* has been on a three-year revision cycle.¹³⁴ The NFPA has issued new editions of both of these documents in 2013, which were published with the same edition year: 2014. There are three reasons that make this significant:

¹²⁸ For general information on the NFPA's consensus-based process for developing codes and standards, see *Standards Development Process*, NFPA.ORG (2014), <http://www.nfpa.org/categoryList.asp?categoryID=161&URL=Codes%20&%20Standards/Standards%20development%20process>.

¹²⁹ *Travelers Property & Casualty Corp. v. General Electric Co.*, 150 F.Supp. 2d 360, 366 (D. Conn. 2001) (calling *NFPA 921* "a peer reviewed and generally accepted standard in the fire investigation community.").

¹³⁰ See, e.g., the discussion of error rates in the NRC/NAS REPORT, *supra* note 53, at 117–122.

¹³¹ *NFPA 921* (2014 ed.), *supra* note 9, ch. 2.

¹³² See, e.g., *NFPA 921* (2011 ed.), *supra* note 9, ch. 2 ("Referenced Publications"), annex A ("Explanatory Material"), annex B ("Bibliography"), annex C ("Informational References").

¹³³ *NFPA 1033 Document Information Page*, NFPA.ORG (2014), <http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=1033> (login required) (click the arrow next to the "Edition to Display" link for a drop-down listing of each edition of *NFPA 1033*).

¹³⁴ *NFPA 921 Document Information Page*, NFPA.ORG (2014), <http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=921> (login required) (click the arrow next to the "Edition to Display" link for a drop-down listing of each edition of *NFPA 921*).

- 1) Pivotal portions of *NFPA 1033* much more clearly cross-reference *NFPA 921*, laying a solid foundation to argue that notwithstanding its “guide” status, much of *NFPA 921* is mandatory.
- 2) Both documents include changes that raise the bar for fire investigators.
- 3) Because very important changes to not one, but both of these documents were issued in the same year, it places a greater burden on investigators to adapt.

Cumulatively, these factors add to the mounting storm brewing for fire investigators. This section highlights the importance of the revisions to each of these documents, starting with *NFPA 1033*.

Over 60 proposed changes to *NFPA 1033*, 2009 edition, were submitted.¹³⁵ Many were accepted, in form or in principle. Two of these changes are crucial because they lay the groundwork for the rest of the standard, setting forth the standard’s scope, purpose, and umbrella requirements for an investigator’s qualifications. Prior to the 2009 edition of *NFPA 1033*, the minimum educational requirements for investigators as set forth in Chapter 1 were fairly inconsequential, requiring a high school diploma, and that the investigator remain current with, “investigation methodology, fire protection technology, and code requirements by attending workshops, seminars, and/or through professional publications and journals.”¹³⁶ The 2009 edition expanded these educational requirements to include a requirement that the investigator must maintain a minimum basic knowledge, beyond the high school level, of 13 listed topics, ranging from fire science and explosion dynamics, to fire investigation methodology and failure analysis.¹³⁷

Most of the proposals for the 2014 edition addressed this infamous list of 13. Some people proposed to expand the list, others to simplify and consolidate it. In the proposals to change the 2009 list of 13, some subjects on this list, such as “fire investigation” were not surprising and drew no proposals. Others, such as “thermometry” have caused consternation among some in the fire investigation community and attracted several revision proposals.¹³⁸

The Technical Committee responsible for *NFPA 1033*, on its own motion, proposed to keep the existing list of 13, and expand it to a list of 16. Further, they modified the surrounding paragraphs. Ultimately, these changes were accepted. Below we have reproduced this list as part of the text showing the expansion from the list of 13 to the list of 16 in a section that was re-numbered as 1.3.7. In the following list, underscoring indicates words that were inserted from the 2009 to the 2014

¹³⁵ Nat’l Fire Prot. Ass’n Technical Comm. on Fire Investigator Professional Qualifications, *Report on Proposals for NFPA 1033 Standard for Professional Qualifications for Fire Investigator*, in 2013 ANNUAL REVISION CYCLE REPORT ON PROPOSALS 1033-1 (Nat’l Fire Prot. Ass’n ed., 2012) available at <http://www.nfpa.org/Assets/files/AboutTheCodes/1033/1033-A2013-ROP.pdf> (last visited Jan. 17, 2014) [hereinafter *NFPA 1033 2014 ed. ROP*].

¹³⁶ *NFPA 1033* (2003 ed.), *supra* note 10, §§ 1.3.2, 1.3.7.

¹³⁷ *NFPA 1033* (2009 ed.), *supra* note 10, § 1.3.8.

¹³⁸ See *NFPA 1033 2014 ed. ROP*, *supra* note 135, at 1033-5–1033-13 (containing proposals to change §§ 1.3.7–1.3.8, A.1.3.7–A.1.3.8 in the 2014 edition of *NFPA 1033*).

editions, while a strike-through indicates wording deleted from the 2009 edition language. In the list in the new section 1.3.7 below, the first 13 items were in the 2009 edition and numbers 14 to 16 are new in the 2014 edition. Immediately following and indented below each of the relevant sections, we have reproduced the pertinent Annex material. The asterisks and sections starting with the letter “A” indicate material that appears in Annex A of the 2014 edition:

~~1.3.7*~~ **1.3.8*** The fire investigator shall remain current ~~with investigation methodology, fire protection technology, and code requirements in the topics listed in section 1.3.7~~ by attending formal education courses, workshops and seminars and/or through professional publications and journals.

Annex A: ~~A.1.3.7~~ A.1.3.8 Fire investigation technology and practices are changing rapidly. It is essential for an investigator’s performance and knowledge to remain current. It is recommended that investigators be familiar with the technical information and procedural guidance presented in materials such as NFPA 921 and *Fire Protection Handbook*.

~~1.3.8*~~ **1.3.7*** The investigator shall have and maintain at a minimum an up-to-date basic knowledge of the following topics beyond the high school level: ~~at a post-secondary education level:~~

- (1) Fire science
- (2) Fire chemistry
- (3) Thermodynamics
- (4) Thermometry
- (5) Fire dynamics
- (6) Explosion dynamics
- (7) Computer fire modeling
- (8) Fire investigation
- (9) Fire analysis
- (10) Fire investigation methodology
- (11) Fire investigation technology
- (12) Hazardous materials
- (13) Failure analysis and analytical tools
- (14) Fire protection systems
- (15) Evidence documentation, collection, and preservation
- (16) Electricity and electrical systems

Annex A: A.1.3.8 A.1.3.7 Basic up-to-date information on these topics can be found in the current edition of NFPA 921 *Guide for Fire and Explosion Investigations*. NFPA 921 is written on a basic level for competency in fire and explosion investigation and updated on a three year cycle “to establish guidelines and recommendations for the safe and systematic investigation or analysis of fire and explosion incidents” and “is designed to produce a systematic, working framework or outline by which effective fire and explosion investigation and origin and cause analysis can be accomplished.” As stated in NFPA 921 “[It] is not intended as a comprehensive scientific or engineering text... many scientific and engineering concepts are presented within the text, the user is cautioned that these concepts are presented at an elementary level and additional technical sources, training, and education may often need to be utilized in an investigation. The documents or portions thereof listed in this [document] are referenced within this guide and shall be considered part of the requirements of this document.”¹³⁹

According to the NFPA’s rules, information in Annex A is explanatory material, included for informational purposes only and is not part of the mandatory requirements of the *NFPA 1033* standard.¹⁴⁰ However, regardless that the Annex A material referencing *NFPA 921* is not mandatory, it provides ammunition for coordinating the use of *NFPA 1033* and *NFPA 921* in court, by emphasizing that:

- On one hand, while *NFPA 1033* points to *NFPA 921* as providing up-to-date information on the list of 16, it may not be enough because *NFPA 921* presents many scientific and engineering concepts at an “elementary level” requiring additional resources and training.
- In this context, the annex quotes *NFPA 921*, which specifically references other documents that it incorporates and that are considered part of the requirements of *NFPA 921*. If one looks to identify these other documents, they will come to *NFPA 921*’s Chapter 2, which lists over a hundred resources, several of which are substantial, and all of which are incorporated by reference into the requirements of *NFPA 921*.

Among the 100-plus documents listed in *NFPA 921*’s Chapter 2 are over 20 NFPA codes, standards, and guides, more than 30 ASTM standards, and substantial (*i.e.* long and complex) authoritative books such as NFPA’s *Fire Protection Handbook*, D. Drysdale’s *An Introduction to Fire Dynamics*, V.

¹³⁹ *NFPA 1033 2014 ed. ROP, supra* note 135, at 1033-5–1033-13 (respecting proposals to change §§ 1.3.7–1.3.8, A.1.3.7–A.1.3.8 in the 2014 edition of *NFPA 1033*).

¹⁴⁰ Nat’l Fire Prot. Ass’n, *Regulations Governing Committee Projects*, in *NFPA STANDARDS DIRECTORY* 16, 23 § 3.3.6.1 (2012). These regulations apply to *NFPA 1033 2014 ed.* and all previous editions of that document. *NFPA 1033* is, by definition, an NFPA standard and these regulations define what is part of the mandatory requirements of a standard, as distinguished from annex material as follows:

Standard - A document, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. *Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. Id.* [Emphasis added.]

Babrauskas' *Ignition Handbook*, the Society of Fire Protection Engineers' *SFPE Handbook of Fire Protection Engineering*.¹⁴¹

Handled through skillful courtroom advocacy, an expert or attorney can link the mandatory requirements of *NFPA 1033* to the recommendations and information in *NFPA 921*, which in turn cross-references multiple other reference works. This can be the thin edge of the wedge to open up an expert on his or her qualifications in each subject on the list of 16 based on not only *NFPA 921*, but on the references listed within *NFPA 921*. Imagine an attorney cross-examining someone on his or her knowledge of the material in *NFPA 921*, as well as the volumes of authoritative works it references!

Even if the revised text were removed from section A.1.3.8 in the 2014 edition of Annex A, it would not matter. Section A.1.3.7 points to *NFPA 921* and the words in the revision are already in Chapter 1 of *NFPA 921*, 2011 edition, and ready for experts and attorneys to use as described above. The revised wording in the *NFPA 1033* Report on Proposals simply helps connect the dots for those not intimately familiar with *NFPA 921* and *NFPA 1033*.

For an investigator who says “yes, but 921 is not mandatory”—fine. What is the alternative? Given the *Daubert* requirement for an expert to be qualified, and that *NFPA 1033* is the undisputed qualification standard for fire investigators, how does a fire expert whose qualifications are challenged demonstrate his or her competencies in each of the fields on the list of 16? *NFPA 1033* does not contain the knowledge and competencies required to comply with this list. Investigators have to look elsewhere. One who wants to avoid dealing with *NFPA 921* will have to find some other authoritative support that is peer-reviewed and generally accepted. Take away *NFPA 921* together with the references it cites, then one does not have much left to substantiate the sufficiency of one's qualifications in each of the subjects on the list of 16. While a lesson in courtroom tactics would be necessary to demonstrate how these scenarios can play out in litigation, suffice it to say the changes to *NFPA 1033* 2014 edition are potent in the hands of skilled experts or advocates.

In addition to changes to the list of 13, other changes in the 2014 edition include definitions that were added to *NFPA 1033* for some of the topics on the list of 13, including “fire investigation technology,” “Fire Analysis,” “Fire Dynamics,” and “Fire Science.” For the most part, the new definitions are identical to the definitions of the same terms in *NFPA 921*.¹⁴² Thus, the mandatory standard, *NFPA 1033*, builds another bridge to connect these two documents.

¹⁴¹ *NFPA 921* (2014 ed.), *supra* note 9, ch. 2 (“Referenced Publications”).

¹⁴² Compare *NFPA 1033* (2014 ed.), *supra* note 10, §§ 3.3.2, 3.3.4, 3.3.8, with *NFPA 921* (2014 ed.), *supra* note 9, §§ 3.3.63, 3.3.65, 3.3.71. (The definitions of “fire analysis,” “fire dynamics,” and “fire science,” now appear in both *NFPA 1033* 2014 ed. and *NFPA 921* 2014 ed. and all 3 definitions are identical.)

Another change that occurred in the 2014 edition deals with Chapter 1, amending the scope of *NFPA 1033*. Here is the new scope statement:

1.1* Scope. This standard identifies the *minimum* job performance requirements (JPRs) for fire investigators. [Emphasis added.]¹⁴³

While this change is designed to promote consistency with NFPA's other professional qualifications standards, it underscores that *NFPA 1033* merely specifies the minimum requirements of the duties of an investigator. When read together with the new paragraph 1.3.7, above, achieving a basic knowledge of the list of 16 may not be enough in some circumstances. In a litigation context during a battle of experts, this has potential significance when evaluating the level of a fire investigator's qualifications. It is also a valuable tool for comparing and contrasting the qualifications of experts on opposite sides of a case. If one expert's qualifications "meet" the minimum requirements of *NFPA 1033*, how does that measure up with an expert who is able to testify that his or her qualifications "meet or exceed" *NFPA 1033's* minimum requirements?

We have only touched on a small number of the revisions in *NFPA 1033*, 2014 edition. One can see, however, that though the recommendations seek to change only a limited number of words, the impact of these recommendations, if accepted, is potentially huge. Interested readers can track the changes to *NFPA 1033* and the reasoning behind them by reading the Report on Proposals and the Report on Comments,¹⁴⁴ available through the *NFPA 1033* Document Information Page at NFPA's website, www.nfpa.org.¹⁴⁵

5.3.CHANGES IN THE 2014 EDITION OF *NFPA 921*

In terms of the revisions in the 2014 edition of *NFPA 921*, below are highlights.¹⁴⁶ This list does not purport to summarize every change. Everyone using *NFPA 921* should examine the complete text of changes in the new edition and compare them to related portions of the 2011 edition.

- Throughout the document:
 - ✓ Color photos and images replace black and white ones from the 2011 edition, including the addition of many new photos, figures, and images.

¹⁴³ *NFPA 1033* (2014 ed.), *supra* note 10, § 1.1.

¹⁴⁴ *NFPA 1033 Document Information Page*, NFPA.ORG (2014), <http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=1033> (login required) (next to "Edition to display" click 2014, and then to download the Report on Proposals and the Report on Comments, click the "Read the archived information" link).

¹⁴⁵ *NFPA 1033 Document Information Page*, NFPA.ORG (2014), <http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=1033>.

¹⁴⁶ *NFPA 921* (2014 ed.), *supra* note 9. See also, NAT'L FIRE PROT. ASS'N TECHNICAL COMM. ON FIRE INVESTIGATIONS, FIRST DRAFT REPORT *NFPA 921 PART 1 OF 2* (Nat'l Fire Prot. Ass'n ed., 2012) available at http://www.nfpa.org/Assets/files/AboutTheCodes/921/921_F2013_FDR_Part1.pdf (last visited Jan. 17, 2014) and

- ✓ In Chapter 1 a new recommendation has been added called “Measurement Uncertainty,” dealing with the reproducibility of measurements reported in *NFPA 921*, advising users to evaluate all reported measurements or factors in equations “to assess whether the level of precision expressed is appropriate or broadly applicable.” Corresponding changes have been made in many chapters to address this issue.
- ✓ Because a new chapter (Fire Protection Systems) has been added, and Chapter 19 (Analyzing the Incident for Cause and Responsibility) has been divided into two chapters, all of the chapters after number 7 have been renumbered.
- Seven new and six revised definitions of important fire investigations terms and concepts appear, including accelerant, clean burn, incendiary fire, scientific method, arc mapping, empirical data, thermometry, and trailer.
- In Chapter 4 Basic methodology, “Test the Hypothesis (Deductive Reasoning)” has been re-written, with corresponding changes to the annex; and the “Confirmation Bias” portion has been revised.
- Chapter 5 Basic Fire Science has new material added respecting Thermometry and Heat Release Rate and Chapter 6 Fire Patterns has revisions to the text dealing with several subjects, many of which correspond to changes in the Definitions.
- Four new sections have been added to the Building Systems chapter dealing with the relevance of fire protection systems and a new section on Documentation and Data Collection has been added.
- A new Chapter 8, Fire Protection Systems has been added.
- The Electricity and Fire chapter has extensive changes relating to arcing through char, arc melting, and arc mapping.
- The Legal Considerations chapter has revisions to the spoliation of evidence portions.
- The Documentation of the Investigation chapter has substantial revisions to accommodate the change in technology from film to digital photography and to expand recommendations for documenting the scene using photos and images.

NAT'L FIRE PROT. ASS'N TECHNICAL COMM. ON FIRE INVESTIGATIONS, FIRST DRAFT REPORT *NFPA 921 PART 2 OF 2* (Nat'l Fire Prot. Ass'n ed., 2012) available at http://www.nfpa.org/Assets/files/AboutTheCodes/921/921_F2013_FDR_Part2.pdf [hereinafter collectively *NFPA 921 2014 ED. FIRST DRAFT REPORT*], and *921 2014 ED. SECOND DRAFT REPORT* available at *NFPA 921 Document Information Page*, NFPA.ORG (2014), <http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=921> (login required) (next to “Edition to display” click 2014, and then to access the *SECOND DRAFT REPORT*, click the “Read the archived information” link). (The changes listed appear in *NFPA 921 (2014 ed.)*. The reasoning behind the changes are in the *FIRST DRAFT REPORT* and *SECOND DRAFT REPORT*.)

- The Physical Evidence chapter has new paragraphs on the subjects “Flag, Bag, and Tag,” and “Evidence List,” which add recommendations on how to identify, protect, and mark physical evidence, as well as maintaining complete documentation and a detailed evidence list.
- The Origin Determination chapter has revisions to reflect advances in research.
- The most significant changes in the Cause Determination chapter are respecting the “Process of Elimination,” revised to clarify the text from the 2011 edition.
- Material from Chapter 19 of the 2011 Edition (Analyzing the Incident for Cause and Responsibility) is used to create two different Chapters, 20 and 21, because the Committee believed it more appropriate to have different chapters for fire cause classification and responsibility determination. The previous section 19.1 dealing with fire cause classifications forms the new chapter 20, and the remaining material on causes of the fire, causes of damages to property, causes of bodily injury or loss of life, as well as determining responsibility, forms the new Chapter 21.
- In Failure Analysis and Analytical Tools, a new section called, “Guidelines for Selection and Use of a Fire Model” has been added.
- In the Incendiary Fire chapter, changes include new definitions of incendiary fire and trailers.
- Finally, you will find numerous changes to the Explosions chapter and Motor Vehicle Fires chapter, and every chapter in the document has been revised in some respect, most often to clarify concepts or update information to reflect the most current research. Annex A has been changed to reflect revisions in the chapter sections to which each entry relates, Annex C has new references added and old ones updated, and a new Annex D credits people who supplied photographs for the 2014 edition.

Numerous changes are significant for litigation purposes. For example:

- 1) The addition of the new concept of “measurement uncertainty” will provide ample avenues for cross-examination whenever experts are relying heavily on precise measurements from the affected sections.
- 2) Changes to definitions and key concepts, particularly to terms such as accelerant, incendiary fire, trailer, clean burn, empirical data, and the scientific method are ripe with opportunities to challenge experts who use these words in their reports or testimony and have not kept abreast of the implications of these changes in their opinions.
- 3) The color photos and images now provide additional clarity to the ideas and phenomena they are intended to demonstrate, and can be used to confront opinions that are inconsistent with what these color images now more clearly show.
- 4) A growing emphasis on collecting and documenting data and physical evidence provides new avenues to contest the adequacy of the work done by investigators in collecting and

documenting evidence on and off the scene. This has potential implications on their hypothesis testing, which in turn, affects the reliability of how they applied the ever-more-important scientific method.

5) Finally, changes to all of the sections that have been popular topics in litigation such as spoliation, the process of elimination, and confirmation bias, will continue to fuel disputes for litigation purposes.

Details concerning these revisions are available for review in the *First Draft Report* and *Second Draft Report* of *NFPA 921*, 2014 edition, available on the NFPA's website, through the *NFPA 921 Document Information Page*.¹⁴⁷

5.4. UNTOLD POWER OF *NFPA 1033* AND *NFPA 921*, UNITED THROUGH THEIR 2014 EDITIONS

In summary, the essential reasons that these changes to the 2014 editions of *NFPA 1033* and *NFPA 921* are so crucial, are as follows. There is no question that *NFPA 1033* is a standard, placing mandatory minimum requirements on fire investigators. Yet, until the 2009 edition added the original list of 13, *NFPA 1033* had no real teeth with which to challenge an expert witness' qualifications or opinions. *NFPA 921* has been the document that has risen in notoriety, if not popularity, as a weapon to challenge fire experts. Nevertheless, experts who wanted to dodge the effect of *NFPA 921* in court testified that it is not mandatory, but is merely a "Guide," referring to its title. It is true that by NFPA's definitions, "guides" such as *NFPA 921* do not contain any mandatory requirements.

However, consider the combined results of the revisions to *NFPA 1033* stepping up the minimum and mandatory knowledge and methodology requirements for investigators, with the corresponding sections of *NFPA 921* that *NFPA 1033* expressly cross-references. It does not take much imagination to understand how an attorney can link together these documents in a legal challenge, elevating much of *NFPA 921* to mandatory status by cross-referencing it to the mandatory provisions of *NFPA 1033*. This has two likely consequences in the hands of a skillful advocate: 1) it gives teeth to *NFPA 1033* as a tool for cross-examining fire experts, whether in the context of disputing the admissibility of their testimony or attacking its weight at trial, and 2) when taken together, a court can justifiably treat significant portions of *NFPA 921* as mandatory.

When taken alone, the likely revisions to the 2014 edition of *NFPA 921* are demanding in themselves because they further refine the knowledge and skills required by fire investigators. The revisions span the entire document, and therefore investigators will need to invest some serious study time in order to assimilate the new material, distinguish it from the old, and appreciate the implications

¹⁴⁷ *NFPA 921 Document Information Page*, NFPA.ORG (2014),

<http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=921> (login required) next to "Edition to display" click 2014, and then to access the FIRST DRAFT REPORT or the SECOND DRAFT REPORT, click the "Read the archived information" link).

of the changes. Even though NFPA takes the position that people are entitled to a reasonable time to adapt to new editions of documents that form part of NFPA's *National Fire Codes*®,¹⁴⁸ courts are more likely to look to the date these documents are issued to determine when they apply.

6. CONCLUSION TO PART I

This article centers on our prediction that three forces are converging towards a generally more intense inquiry of the reliability of fire investigators' expert testimony. Part I describes the three forces, which are already in motion and that together will have a tremendous effect on fire litigation:

- 1) the judicial scrutiny now typically undertaken of expert testimony under *Daubert* and its offspring and the power of judges under *Daubert* to exclude or limit the testimony of fire experts whose qualifications are insufficient or whose testimony is unreliable,
- 2) an increasing alarm about wrongful convictions involving faulty forensic science evidence including fire investigations, and;
- 3) the rising bar of industry standards for fire investigators, particularly through the ever-evolving industry standards: *NFPA 1033* and *NFPA 921*.

In Part II, we enter the heart of this article, describing how these three forces are converging and causing a reinvigoration of *Daubert*.

PART II

7. INTRODUCTION TO PART II

In this Part, we identify and analyze causes that contribute to a perfect storm for fire investigators in court, given the forces we have addressed in Part I. The first cause is a growing awareness—awareness among attorneys, judges, and even the public about unreliable aspects of the process of fire investigations. This will motivate the justice system to apply increasing vigilance when handling the evidence of fire experts. In this respect, tools of choice to evaluate the qualifications experts and

¹⁴⁸ NAT'L FIRE PROT. ASS'N, NATIONAL FIRE CODES® (2014) (including over 300 codes, standards, guides, and recommended practices all created through the ANSI accredited standards development process).

reliability of their opinions are *NFPA 1033 Standard for Professional Qualifications for Fire Investigator*¹⁴⁹ (*NFPA 1033*) and *NFPA 921 Guide for Fire and Explosion Investigations*¹⁵⁰ (*NFPA 921*).

A second cause of the perfect storm is a heightened role of these two industry standards, particularly significant with the implementation of the changes in the 2014 editions of these documents. The third cause is what we call the new *Daubert* factors, in which we explore the thorny area of subjectivity and bias as it relates to forensic sciences and fire investigations.

We begin by considering why we still consider the *Daubert* case and its progeny to have an influence in the coming of the perfect storm, even though investigators have had two decades to learn how to deal with *Daubert*. Therefore, this Part begins by considering the reasons why fire investigators have weathered the first part of the *Daubert* storm, and how the *NRC/NAS Report* and the TFSC reports, outlined in Part 1, are building pressure that are reinvigorating the potential of reliability inquiries such as that instituted by *Daubert*.

8. THE PERFECT STORM

8.1. WHY FIRE INVESTIGATORS HAVE WEATHERED THE FIRST FRONT OF THE *DAUBERT* STORM

To a significant extent, *Daubert* was like a storm, the first front of which fire investigators have weathered. We postulate that there are three main reasons that *Daubert* has not been more of an ordeal for fire investigators, particularly in criminal situations.

First, for many years, *Daubert* or its state counterparts were not applied often in criminal cases. When the defense challenged prosecution experts under *Daubert* or its state equivalents, the challenges typically failed.¹⁵¹ While technically *Daubert* applies equally in criminal courts, several jurists have observed that the courts have not applied it with the same degree of rigor in criminal as in civil cases, nor applied it as strictly to prosecution as it has to defense experts. The author of

¹⁴⁹ NAT'L FIRE PROT. ASS'N TECHNICAL COMM. ON FIRE INVESTIGATOR PROFESSIONAL QUALIFICATIONS, *NFPA 1033 STANDARD FOR PROFESSIONAL QUALIFICATIONS FOR FIRE INVESTIGATOR* [hereinafter *NFPA 1033*] (1987 ed., 1993 ed., 1998 ed., 2003 ed., 2009 ed., 2014 ed.). We use the short form, "*NFPA 1033*" when referring generally to that document, in whatever edition is applicable in the context. When referring to a specific edition of *NFPA 1033*, the edition is also cited.

¹⁵⁰ NAT'L FIRE PROT. ASS'N TECHNICAL COMM. ON FIRE INVESTIGATIONS, *NFPA 921 GUIDE FOR FIRE AND EXPLOSION INVESTIGATIONS* [hereinafter *NFPA 921*] (1992 ed., 1995 ed., 1998 ed., 2001 ed., 2004 ed., 2008 ed., 2011 ed., 2014 ed.). We use the short form, "*NFPA 921*" when referring generally to that document, in whatever edition is applicable in the context. When referring to a specific edition of *NFPA 921*, the edition is also cited.

¹⁵¹ See, e.g., Paul C. Giannelli, *Daubert and Criminal Prosecutions*, 26-FALL CRIM. JUST. 61, 62 (2011) [hereinafter Giannelli, *Daubert and Criminal Prosecutions*] (citing several instances where the authors of the *NRC/NAS REPORT*, *supra* note 53, acknowledge the difference between the treatment of *Daubert* and the validity and reliability of expert forensic evidence in civil and criminal cases, finding the scrutiny of experts under *Daubert* much more robust in civil cases).

an early and well-known empirical study comparing the application of *Daubert* in civil versus criminal cases concluded:

[A]s to proffers of asserted expert testimony, civil defendants win their *Daubert* reliability challenges to plaintiffs' proffers most of the time, and . . . criminal defendants virtually always lose their reliability challenges to government proffers. And, when civil defendants' proffers are challenged by plaintiffs, those defendants usually win, but when criminal defendants' proffers are challenged by the prosecution, the criminal defendants usually lose.¹⁵²

This is interesting, because it defies two logical inferences. One might expect that courts would apply *Daubert* more rigorously to the party that bears the burden of proof in either civil or criminal cases. Nevertheless, this is not so. The prosecution bears the burden in criminal cases, and the plaintiffs in civil cases, yet the rates of prosecution experts surviving *Daubert* challenges are noticeably greater than the survival rates of civil plaintiff experts. Alternatively, one might expect that courts would apply *Daubert* equally to defense experts, regardless of whether they are in civil or criminal cases. However, this hypothesis is not borne out, since empirical research shows criminal defense experts seem to have a much harder time than do civil defense experts under *Daubert* scrutiny.

This trend, noted early in the post-*Daubert* era, has continued.¹⁵³ There are several explanations for these discrepancies. It may be that criminal defense counsel are under-funded or insufficiently skilled in dealing with the complexities of some types of expert testimony, or that they do not have the resources to access to the same pool of expert witnesses that are available to the prosecution in criminal cases.¹⁵⁴ Just imagine the limits of resources available to a public defender of an impoverished defendant in a criminal case when compared to what is available to a private law firm defending a well-insured, wealthy corporation, in a civil product liability action. Another possibility, as noted by one judge, is that “that there is a systemic pro-prosecution bias on the part of judges and that such a bias is reflected in admissibility decisions, regardless of the standard of admissibility.”¹⁵⁵

Whatever the explanation, our review of the empirical research supports two things. First, that there are a significantly greater number of *Daubert* challenges in civil than in criminal cases. Second, where attorneys make *Daubert* challenges in criminal cases, there is a much greater likelihood that the court will preclude the defense, rather than the prosecution experts, from testifying. So to

¹⁵² D. Michael Risinger, *Navigating Expert Reliability: Are Criminal Standards of Certainty Being Left on the Dock?* 64 ALB. L. REV. 99, 99 (2000).

¹⁵³ At least until the NRC/NAS REPORT, *supra* note 53. See, e.g., Giannelli, *Daubert and Criminal Prosecutions*, *supra* note 151, at 62.

¹⁵⁴ See Peter J. Neufeld, *The (Near) Irrelevance of Daubert to Criminal Justice and Some Suggestions for Reform*, 95 AM. J. PUB. HEALTH (Supp. 1) S107 (2005), available at <http://www.defendingscience.org/sites/default/files/upload/NeufeldDAUBERT.pdf> (last visited Jan. 17, 2014).

¹⁵⁵ Judge Donald E. Shelton, *Forensic Science Evidence and Judicial Bias in Criminal Cases*, 49 No. 3 JUDGES' J. 18, *22 (2010).

conclude, the first reason that some fire experts have been relatively unaffected by *Daubert* is that they are members of the public sector testifying in criminal cases, and as such have either not been challenged under *Daubert* or have benefited from being prosecution experts.

The second reason that fire investigators seem to have weathered the *Daubert* storm deals with the use of legal precedent. It is always open for courts to follow some earlier case decision that has analogous facts to the case at bar, instead of wrestling with thorny reliability or qualification issues as measured by *Daubert* factors. As one jurist noted, “the courts often ‘affirm admissibility citing earlier decisions rather than facts established at a hearing.’”¹⁵⁶ In other words, when counsel offers a precedent or a persuasive authority for admitting a certain type of expert testimony, courts may defer to that earlier case. Using the earlier case as authority, they can admit the expert testimony in the case before them rather than delving deeply into the facts and wrestling with otherwise difficult reliability issues. A number of reported decisions admit the evidence of fire experts who link their investigations to *NFPA 921*. Using this tactic, together with offering one or more of the many prior cases where courts hold that opinions based on *NFPA 921* are reliable, makes it easier for courts in subsequent cases to accept as reliable evidence that the expert has similarly tied to *NFPA 921*.

The justice system grants trial courts more than enough leeway to avoid making hard decisions on reliability issues merely by relying on earlier cases because of the limited level of review available on appeal of evidentiary rulings, including *Daubert* decisions:¹⁵⁷

[T]he law grants a district court the same broad latitude when it decides *how* to determine reliability as it enjoys in respect to its ultimate reliability determination. See *General Electric Co. v. Joiner*, 522 U.S. 136, 143, 118 S.Ct. 512, 139 L.Ed.2d 508 (1997) (courts of appeals are to apply “abuse of discretion” standard when reviewing district court’s reliability determination).¹⁵⁸ [Emphasis in the original.]

An abuse of discretion standard means that a lower court’s decision will not be overturned unless it is manifestly erroneous,¹⁵⁹ which typically means “grossly unsound, unreasonable, illegal, or

¹⁵⁶ NRC/NAS REPORT, *supra* note 53, at 107 (citing Neufeld, *supra* note 154, at S109, S110. See also Shelton, *supra* note 155, at 22 (“Rather, most of the decisions simply rationalized admissibility based on the prior admission of such evidence by other judges. In other words, the typical analysis was one of *stare decisis*, rather than the scientific inquiry required by *Daubert*.”).

¹⁵⁷ In the Federal courts, the standard for review of a *Daubert* decision is abuse of discretion, which is defined as, “1. An adjudicator’s failure to exercise sound, reasonable, and legal decision-making. 2. An appellate court’s standard for reviewing a decision that is asserted to be grossly unsound, unreasonable, illegal, or unsupported by the evidence.” *Abuse of Discretion Definition*, BLACK’S LAW DICTIONARY (9th ed. 2009), available at Westlaw BLACKS [hereinafter BLACKS *Abuse of Discretion*].

¹⁵⁸ *Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. 137, 142 (1999) (citing *General Electric Co. v. Joiner*, 522 U.S. 136, 143, (1997), “courts of appeals are to apply “abuse of discretion” standard when reviewing district court’s reliability determination.”).

¹⁵⁹ *Joiner*, 522 U.S. at 142 (citations omitted).

unsupported by the evidence.”¹⁶⁰ A judge following a earlier-decided decision that is relevant and authoritative, even one that is not strictly binding, will therefore generally be safe from having the decision overturned on appeal, even when admitting testimony which an appeal court on a *de novo* review¹⁶¹ might rule inadmissible.

The third reason why fire investigators may have weathered the *Daubert* storm is that while *NFPA 921* initially rose to the fore as a sword to be used contesting the admissibility of expert testimony, investigators soon learned that they could justify their opinions and methods by anchoring them to *NFPA 921*. This was true even if they acknowledged *NFPA 921* but could rationalize why they departed from *NFPA 921*'s recommendations.¹⁶² *NFPA 921* opens the door to this approach, saying, “Deviations from these procedures [in *NFPA 921*], however, are not necessarily wrong or inferior but need to be justified.”¹⁶³ This is a lifeline for a judge favoring the admissibility of an expert's testimony where the expert did not follow *NFPA 921*.

Accordingly, even though fire experts may feel that they have largely triumphed over *Daubert*, we expect that another more rigorous round of *Daubert* challenges for fire investigators is in the offing.

8.2. THE STORM IS BUILDING IN WAVES

The perfect storm we predict for fire investigators is building in waves. There is the rumble of distant thunder as the movement towards overhauling forensic science continues to progress and the likelihood that because the *NRC/NAS Report* encompassed fire investigations, so too will its fallout. Let us look at some examples of these proposed overhauls.

On the strength of the *NRC/NAS Report*, several Bills have been introduced in Congress to reform forensic sciences. In January 2011 Senator Patrick Leahy introduced a Bill called “The Criminal Justice and Forensic Science Reform Act.”¹⁶⁴ The purpose of the Leahy Bill was, “To establish an Office of Forensic Science and a Forensic Science Board, to strengthen and promote confidence in the criminal justice system by ensuring consistency and scientific validity in forensic testing, and

¹⁶⁰ BLACKS *Abuse of Discretion*, *supra* note 157, § 2.

¹⁶¹ *Abuse of Discretion Definition*, BLACK'S LAW DICTIONARY (9th ed. 2009), available at Westlaw BLACKS (“An appeal in which the appellate court uses the trial court's record but reviews the evidence and law without deference to the trial court's rulings. — Also termed *de novo review*; *de novo judicial review*.”).

¹⁶² See, e.g., *State v. Schultz*, 58 P.3d 879 (UT App. 2002) (fire investigator testified to a canine alert that was not confirmed by laboratory testing, reading into evidence the section of *NFPA 921* that says the proper use of a canine requires laboratory confirmation of the alert, but explaining reasons why the laboratory may not be able to confirm the canine's alert).

¹⁶³ *NFPA 921* (2014 ed.), *supra* note 9, § 1.3.

¹⁶⁴ The Criminal Justice and Forensic Science Reform Act of 2011, S 132 112 Cong. (2011).

for other purposes.”¹⁶⁵ There has been no action on the bill since it was referred to committee for review.

In July 2012 another Bill was introduced simultaneously in the House and the Senate known as the “Forensic Science and Standards Act of 2012.” It too, was referred to committee. In the main, its purpose is to “establish scientific standards and protocols across forensic disciplines.” Among the “findings” made by Congress and listed as portents for the Bill, are the “need for standards in methods, data interpretation, and reporting, and the importance of preventing cognitive bias and mitigating human factors. . . ”¹⁶⁶ in the forensic sciences, as stressed in the *NRC/NAS Report*. Just as the *NRC/NAS Report* incorporated fire investigations into the umbrella of forensic sciences, so too does this Bill define forensic science broadly enough to envelop this field:

[T]he term ‘forensic science’ means the basic and applied scientific research applicable to the collection, evaluation, and analysis of physical evidence, including digital evidence, for use in investigations and legal proceedings, including all tests, methods, measurements, and procedures.¹⁶⁷

Generally, this Bill provides for the establishment and funding of a “national forensic science research program to improve, expand, and coordinate Federal research in the forensic sciences.”¹⁶⁸ It also delegates power to the National Institute of Standards and Technology (NIST) to “identify or coordinate the development of forensic science standards to enhance the validity and reliability of forensic science activities” in conjunction with standards development organizations. By definition,¹⁶⁹ the NFPA is one such organization.¹⁷⁰

In September 2013, a revised “Forensic Science and Standards Act of 2012” was introduced in the House.¹⁷¹ Like the earlier version, it contains the same definition of “forensic science,” and its stated purpose is to “To establish scientific standards and protocols across forensic disciplines . . .” with

¹⁶⁵ *Id.*

¹⁶⁶ Forensic Science and Standards Act of 2012, HR 6106, 112th Cong. § 2(3) (2012); Forensic Science and Standards Act of 2012, S 3378, 112th Cong. § 2(3) (2012).

¹⁶⁷ House Bill 6106, § 3 3(A); Senate Bill 3378, § 3 3(A).

¹⁶⁸ House Bill 6106, § 4(a); Senate Bill 6106, § 4(a).

¹⁶⁹ House Bill 6106, § 3(4) (“The term ‘standards development organization’ means a domestic or an international organization that plans, develops, establishes, or coordinates voluntary consensus standards using procedures that incorporate openness, a balance of interests, consensus, due process, and an appeals process.”); Senate Bill 6106, § 3(4).

¹⁷⁰ The NFPA is the ANSI-accredited standards development organization in the field of fire protection for the United States. *See generally supra* note 124 and accompanying text.

¹⁷¹ Forensic Science and Standards Act of 2012, HR 3064, 113th Cong. (2013).

the help of NIST and standards development organizations (of which the NFPA is one). This Bill, too, has been referred to committee.

Consider for a moment the overall direction signaled by these Bills, together with the initiatives taken by the executive and the federal government as discussed in Part I of this article.¹⁷² First, the Executive Office of the President established in 2009 the Subcommittee on Forensic Science, which, in turn, created five Inter-agency Working Groups (IWGs) to investigate and report on the changes needed in forensic science, including standards and protocols.¹⁷³ Second, the federal government established the National Commission on Forensic Science (the Commission) with a mandate to “standardize national guidance for forensic science practitioners,” including policy recommendations on “requirements for training and certification.”¹⁷⁴

At the time of writing this article in 2014, it is not possible to predict the future of this or similar proposed legislation, the outcomes of the Subcommittee on Forensic Science and its IWGs, or the changes the Commission may make. One thing is clear: the introduction of these initiatives heralds a sea change in the offing. The momentum from the *NRC/NAS Report* continues to build, leading to improved methods of ensuring the validity and reliability of “forensic sciences” (an umbrella broad enough to encompass fire investigations).

Though these changes appear distant, if they do come to govern fire investigations, *NFPA 1033* and *NFPA 921* are bound to factor into the equation. They are industry standards, created by a national standards organization, which provide national guidance and standards for the conduct of fire investigations, as well as requirements for training and certification. Therefore, if these envisioned reforms eventually envelop fire investigations, we anticipate that *NFPA 921* and *NFPA 1033* will be at the storm front.

Now, while the executive and legislative branches of government continue to struggle to implement the needed reform of forensic science, what of the judicial branch? While we analogized the initiatives of the legislative and executive branches of government to distant thunder, we believe it is from the judicial branch that the front wave of the storm is imminent, if it has not already begun to strike.

To the extent that judges and attorneys in earlier *Daubert* cases did not have the benefit of the insights provided by publications such as the *NRC/NAS Report* and the TFSC reports¹⁷⁵ as outlined earlier in this article, they may have overlooked some of the significant reliability concerns respecting forensic sciences in general, and fire investigations in particular. While the actions of the Commission, recommendations from the IWGs *via* the Subcommittee on Forensic Science, or legislative outcomes might provide a partial answer at some future time, it is still within the domain

¹⁷² See subsection 4.2 *supra*, starting at p. 13.

¹⁷³ See subsection 4.2 *supra*, starting at p 13.

¹⁷⁴ See, subsection 4.2 *supra*, starting at p. 15.

¹⁷⁵ TFSC FINAL REPORT, *supra* note 93; TFSC ADDENDUM REPORT, *supra* note 106.

of the justice system to step up and address these problems with the power given to it by *Daubert* and its state equivalents.

Some fire investigation experts have developed tactics of using *NFPA 921* and *NFPA 1033* as shields from *Daubert* attacks. To some extent, these tactics will continue to work. However, as attorneys and judges continue to deepen their understanding of the frailties of fire and arson investigations, even thoughtful use of these industry standards will not provide a complete shield. In the following sections, we provide support for this conclusion. Later in this article, we also identify some weaknesses that exist in the fire investigation field that the courts have yet not adequately addressed, including the interpretation of fire effects and fire patterns; subjectivity and bias. Hopefully, with the continued growth of awareness of these problems, the justice system will rise to the challenge, as will fire investigators.

8.3.NO ONE LIKES TO BE CALLED “UTTERLY INEFFECTIVE”

It is perhaps trite to say that no one, particularly members of the legal profession, likes to be called “utterly ineffective.” Yet, this is what the *NRC/NAS Report* concludes after examining the legal system’s record in dealing with *Daubert* challenges of forensic experts:

The bottom line is simple: In a number of forensic science disciplines, forensic science professionals have yet to establish either the validity of their approach or the accuracy of their conclusions, and the courts have been *utterly ineffective* in addressing this problem. For a variety of reasons—including the rules governing the admissibility of forensic evidence, the applicable standards governing appellate review of trial court decisions, the limitations of the adversary process, and the common lack of scientific expertise among judges and lawyers who must try to comprehend and evaluate forensic evidence—the legal system is ill-equipped to correct the problems of the forensic science community.¹⁷⁶ [Emphasis added.]

Largely based on this conclusion, one of the recommendations in the *NRC/NAS Report* is to set up an independent agency to oversee the forensic sciences. This appears unlikely to happen any time soon, in light of the government’s decision to have USDOJ and NIST collaborate over the formation and operation of the Commission. However, the *NRC/NAS Report* is continuing to receive much publicity in the legal profession.¹⁷⁷ To the extent that it is so important to attorneys and judges dealing with scientific evidence, it is worthwhile to have a look at just a few of the other unsettling observations made of the legal system in the *NRC/NAS Report*.

¹⁷⁶ NRC/NAS REPORT, *supra* note 53, at 53.

¹⁷⁷ Searches of the title of the *NRC/NAS Report* (“STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD”) made by the authors on January 17, 2014 of WestlawNext, *available at* <http://store.westlaw.com/westlawnext/default.aspx> (subscription required), returns over 75 state and federal cases specifically mentioning this report, and over 435 secondary sources (treatises, law reviews, and law journals) mentioning this report.

First, in comparing the results of *Daubert* challenges in civil and criminal cases, the authors of the *NRC/NAS Report* observe:

Although it is difficult to get a clear picture of how trial courts handle *Daubert* challenges, because many evidentiary rulings are issued without a published opinion and without an appeal, the vast majority of the *reported* opinions in criminal cases indicate that trial judges rarely exclude or restrict expert testimony offered by prosecutors; most *reported* opinions also indicate that appellate courts routinely deny appeals contesting trial court decisions admitting forensic evidence against criminal defendants.¹⁷⁸ . . . [Emphasis in original.]

The situation appears to be very different in civil cases. Plaintiffs and defendants, equally, are more likely to have access to expert witnesses in civil cases, while prosecutors usually have an advantage over most defendants in offering expert testimony in criminal cases. And, ironically, the appellate courts appear to be more willing to second-guess trial court judgments on the admissibility of purported scientific evidence in civil cases than in criminal cases.¹⁷⁹

Later, in considering the rigor with which forensic evidence is analyzed in criminal cases, the *NRC/NAS Report* goes on to observe:

Review of reported judicial opinions reveals that, at least in criminal cases, forensic science evidence is not routinely scrutinized pursuant to the standard of reliability enunciated in *Daubert*. The Supreme Court in *Daubert* indicated that the subject of an expert's testimony should be "scientific knowledge"—which implies that such knowledge is based on scientific methods—to ensure that "evidentiary reliability will be based upon scientific validity." The standard is admittedly "flexible," but that does not render it meaningless. Any reasonable reading of *Daubert* strongly suggests that, when faced with forensic evidence, "trial judge[s] must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable." As the reported cases suggest, however, *Daubert* has done little to improve the use of forensic science evidence in criminal cases.¹⁸⁰

One can clearly see how this is embarrassing for the justice system. On the other hand, from the case reports as well as scholarly writings of leaders in the legal profession, it appears the legal system is responding to the battle cry of the *NRC/NAS Report*.¹⁸¹

¹⁷⁸ NRC/NAS REPORT, *supra* note 53, at 11 (citations omitted).

¹⁷⁹ NRC/NAS REPORT, *supra* note 53, at 11 (citations omitted).

¹⁸⁰ NRC/NAS REPORT, *supra* note 53, at 106.

¹⁸¹ See, e.g., Christine Funk, *Rising to the Challenge of the NAS Report Strengthening Forensic Science in the United States: A Path Forward: A Call for Demonstrated Competence Amongst Legal Practitioners*, 37 WM. MITCHELL L. REV. 683; Paul C. Giannelli, *The 2009 NAS Forensic Science Report: A Literature Review*, 48 NO. 2 CRIM. LAW BULLETIN ART 6 (2012) [hereinafter Giannelli, *NRC/NAS Report Literature Review*].

Setting the tone, in 2009, the same year that the *NRC/NAS Report* was published, the United States Supreme Court issued a judgment supporting its findings. In *Melendez-Diaz v. Massachusetts*,¹⁸² the Court considered if a criminal defendant's Sixth Amendment confrontation right was violated when the trial court admitted into evidence certificates of analysis prepared by laboratory analysts, without requiring the analysts to be available to be cross-examined at trial. The Court held, in part, that analysts could not avoid the defendant's Sixth Amendment confrontation rights on the basis that the certificates were the subject of "neutral scientific testing," and inherently trustworthy. In other words, analysts were subject to cross-examination on their reports and conclusions. In its reasons, the Court went beyond what was necessary to decide this case, and in conceding that there are issues with "subjectivity, bias, and unreliability of common forensic tests,"¹⁸³ the Supreme Court went on to say:

Confrontation is designed to weed out not only the fraudulent analyst, but the incompetent one as well. Serious deficiencies have been found in the forensic evidence used in criminal trials. One commentator asserts that "[t]he legal community now concedes, with varying degrees of urgency, that our system produces erroneous convictions based on discredited forensics." Metzger, *Cheating the Constitution*, 59 Vand. L.Rev. 475, 491 (2006). One study of cases in which exonerating evidence resulted in the overturning of criminal convictions concluded that invalid forensic testimony contributed to the convictions in 60% of the cases. Garrett & Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 Va. L.Rev. 1, 14 (2009). And the National Academy Report concluded:

*"The forensic science system, encompassing both research and practice, has serious problems that can only be addressed by a national commitment to overhaul the current structure that supports the forensic science community in this country."*¹⁸⁴ National Academy Report P-1 [Emphasis in the original *NRC/NAS Report*.] (Footnote omitted.)

Thus for our purposes, in its decision in *Melendez-Diaz*, the United States Supreme Court made two noteworthy points. First, the Court flagged the *NRC/NAS Report* as the harbinger of overhauls necessary for forensic science evidence. Notwithstanding the fact that this statement was incidental to the ruling,¹⁸⁵ coming as it does from the country's highest court, it gives the *NRC/NAS Report* even higher standing than it would otherwise enjoy. Second, the Court highlighted problems beyond the

¹⁸² 557 U.S. 305 (2009).

¹⁸³ *Melendez-Diaz*, 557 U.S. at 319.

¹⁸⁴ *Id.*

¹⁸⁵ *Id.* The comments by the Court respecting the *NRC/NAS Report*, *supra* note 53, were obiter dictum, which Black's Law Dictionary defines as, "A judicial comment made while delivering a judicial opinion, but one that is unnecessary to the decision in the case and therefore not precedential (although it may be considered persuasive).—Often shortened to *dictum* or, less commonly, *obiter*." *Obiter dictum Definition*, BLACK'S LAW DICTIONARY (9th ed. 2009), available at Westlaw BLACKS.

reliability of forensic evidence, specifically commenting on “subjectivity and bias.” We will return to the issues of subjectivity and bias later.

In commenting on *Melendez-Diaz*, Judge Harry Edwards, one of the co-authors of the *NRC/NAS Report*, noted that this decision “is seminaly important for the forensic science community”¹⁸⁶ and went on to remark:

The Court's statements in *Melendez* are, in my view, a not very subtle indictment of our existing forensic science system. It is particularly noteworthy that the Supreme Court did not say that the availability of cross-examination in criminal trials will cure the ills of the forensic science community. Rather, what the Court said was that “[c]onfrontation is one means of assuring accurate forensic analysis.” In other words, cross-examination is a minimal constitutional safeguard that helps to test the reliability of forensic evidence that is offered in criminal trials. But it is far from adequate.¹⁸⁷

Indeed, if cross-examination at trial were enough to ensure scientific expert evidence is reliable, there would have been no need for the Supreme Court in *Daubert* to impose a gate-keeping duty on trial judges to decide if such evidence passes a reliability threshold before it is even admitted at trial.

The reason why scientific evidence from experts should be required to pass a reliability threshold before being admitted at trial and heard by a jury is nicely explained by one trial judge in this way:

When scientific evidence does not meet the minimal requirements, advocacy tools that may be effective as to other evidence are not effective here. Just because the testimony has been admitted sends the jury the message that the opinions are entitled to some weight. See N.J. Schweitzer & Michael J. Saks, *The Gatekeeper Effect*, 15 Psychol. Pub. Pol'y & L. 1, 12 (2009) (“[J]urors assume that judges review scientific evidence before it is presented to them, and that any evidence used in a trial must be above some threshold of quality. Because of these assumptions, jurors seem to be less critical of scientific evidence used in trials and are more persuaded by it.”). Cross-examination suffices only when experts have reached different conclusions, but the underlying approach is sound. Where it is not, exclusion, or in some situations, limitation, is the only option. . . .¹⁸⁸

¹⁸⁶ Harry T. Edwards, *Solving the Problems That Plague the Forensic Science Community*, 50 JURIMETRICS J. 5, 18 (2009). The Honorable Judge Harry T. Edwards co-chaired the Committee on Identifying the Needs of the Forensic Science Community at the National Academy of Sciences, which is the committee that prepared the *NRC/NAS Report*, *supra* note 53.

¹⁸⁷ Edwards, *supra* note 186 at 19 (quoting *Melendez-Diaz v. Massachusetts*, 129 S. Ct. 2527, 2536 (2009)).

¹⁸⁸ See, e.g., *United States v. Hebshie*, 754 F.Supp.2d 89 (D. Mass. 2010). In *Hebshie*, Gertner, J. points out that cross-examination may not be enough when dealing with scientific evidence that will be evaluated by a jury:

When scientific evidence does not meet the minimal requirements, advocacy tools that may be effective as to other evidence are not effective here. Just because the testimony has been admitted sends the jury the message that the opinions are entitled to some weight. See N.J. Schweitzer & Michael J. Saks, *The Gatekeeper Effect*, 15 Psychol. Pub. Pol'y & L. 1, 12 (2009) (“[J]urors assume that judges review scientific evidence before it is presented to them, and that any evidence used in a trial must be above some threshold of quality. Because of these assumptions, jurors seem to be less

It will take some time for the forensic science community and the legislative branches of federal or state governments to work through the problems reported by the NAS with forensic sciences generally, and reported by the TFSC dealing with fire investigations. In the meantime, it seems that it is up to the courts to deal with these issues. If cross-examination is not enough to deal with the “ills of the forensic science community,” it seems that to counter the charge that they have been utterly ineffective in safeguarding the justice system from bad science, the courts are going to have to step up to the plate and reinvigorate *Daubert*.¹⁸⁹

8.4.AWARENESS IS GROWING

As explained in Part I, the evolution of the reliability requirements for expert testimony flowing from *Daubert v. Merrell Dow Pharmaceuticals Inc.*¹⁹⁰ (*Daubert*), has established benchmarks for the admissibility of expert testimony in federal and state courts. Historically attorneys or judges in fire cases may have underutilized the landmark case of *Daubert* in some fire cases due to their lack of knowledge about or experience with the frailties of fire investigations, particularly the examination and interpretation of evidence from fire scenes.

We predict a revitalization of *Daubert*, in part because there is an evolving awareness about systemic problems in the validity and reliability of forensic sciences stemming from the publication of the groundbreaking work prepared by the National Academy of Sciences in the *NRC/NAS Report*. As explained in Part I of this article, the potential impact of the *NRC/NAS Report* cannot be overstated, nor can the fact that fire investigations fall within its scope. When paired with the work

critical of scientific evidence used in trials and are more persuaded by it.”). Cross-examination suffices only when experts have reached different conclusions, but the underlying approach is sound. Where it is not, exclusion, or in some situations, limitation, is the only option. . . . (Citation omitted.)
Id. at 113.

¹⁸⁹ Another approach might be to use jury instructions that clearly set forth the limitations of the forensic evidence in question, based on publications such as the *NRC/NAS Report*, *supra* note 53, the *TFSC Final Report*, *supra* note 93, and the *TFSC Addendum Report*, *supra* note 106.

¹⁹⁰ (1993), 509 U.S. 579.

of the Innocence Project¹⁹¹ and the Texas Forensic Science Commission (TFSC)¹⁹² concerning problems with the reliability of fire pattern interpretation, weaknesses in the area of fire pattern interpretation are being exposed as never before.¹⁹³ This publicity goes a long way to bringing these issues to the attention of those members of the legal profession who might otherwise have been oblivious to these matters.

¹⁹¹ The Innocence Project commissioned a report, INNOCENCE PROJECT ARSON REVIEW COMM., REPORT ON THE PEER REVIEW OF THE EXPERT TESTIMONY IN THE CASES OF *STATE OF TEXAS V. CAMERON TODD WILLINGHAM* AND *STATE OF TEXAS V. ERNEST RAY WILLIS* (2006), available at <http://www.innocenceproject.org/docs/ArsonReviewReport.pdf> [hereinafter ARSON REVIEW REPORT]. The purpose of the report was to peer review the expert testimony in the death penalty cases of Cameron Todd Willingham and Ernest Ray Willis, both convicted in Texas of arson crimes. The gist of this report is that the prosecution's investigators had relied on evidence from their observations at the fire scene, which in the 1990s and earlier had been widely accepted in the fire investigation community as indicative of incendiary fires. Regrettably, particularly for Willingham who was put to death before the report came out, these so-called indicators were based on invalid science. The report concludes with recommendations for continuing and even remedial education, *id.* at 40, for fire investigators about the science of fire scene investigations and how to apply these scientific principles using the scientific method, *id.* at 40–41. This report was widely disseminated by the Innocence Project. More about the Innocence Project can be found on its website, *Mission Statement*, InnocenceProject.org, <http://www.innocenceproject.org/about/Mission-Statement.php> (last visited Jan. 17, 2014). It explains that the Innocence Project is, "an independent nonprofit organization closely affiliated with Cardozo School of Law at Yeshiva University, the Innocence Project's mission is nothing less than to free the staggering numbers of innocent people who remain incarcerated and to bring substantive reform to the system responsible for their unjust imprisonment." *Id.*

¹⁹² The Texas Forensic Science Commission (TFSC) was established in 2005, *About Us*, TEX. FORENSIC SCI. COMM'N (2012) <http://fsc.state.tx.us/about/>. It "investigates complaints that allege professional negligence or misconduct by a laboratory, facility or entity that has been accredited by the Director of the Texas Department of Public Safety that would substantially affect the integrity of the results of a forensic analysis. The term 'forensic analysis' means a medical, chemical, toxicological, ballistic, or other examination or test performed on physical evidence, including DNA evidence, for the purpose of determining the connection of the evidence to a criminal action." *Id.*

¹⁹³ The TFSC looked into the death penalty cases of Cameron Todd Willingham and Ernest Ray Willis, both convicted in Texas of unrelated arson crimes. In the course of its investigation into the debunked fire science that caused Willingham and Willis to be convicted of arson, the TFSC commissioned a report from Dr. Craig Beyler in August, 2009, CRAIG L. BEYLER, ANALYSIS OF THE FIRE INVESTIGATION METHODS AND PROCEDURES USED IN THE CRIMINAL ARSON CASES AGAINST ERNEST RAY WILLIS AND CAMERON TODD WILLINGHAM (August, 2009), reprinted in TEX. FORENSIC SCI. COMM'N, FINAL REPORT WILLINGHAM/WILLIS INVESTIGATION Ex. 7 (April 15, 2009), available at <http://www.fsc.state.tx.us/documents/FINAL.pdf> [hereinafter the BEYLER REPORT]. The *Beyler Report*, which is readily available on the Internet, finds that the investigations in these cases did not meet the standard of care expressed by the 1992 edition of *NFPA 921*, *supra* note 150. A report subsequently prepared in April, 2011 by the TFSC on the Willingham and Willis cases puts forward copious and substantial recommendations to improve fire investigations, TEX. FORENSIC SCI. COMM'N, FINAL REPORT WILLINGHAM/WILLIS INVESTIGATION (April 15, 2009), available at <http://www.fsc.state.tx.us/documents/FINAL.pdf> [hereinafter TFSC FINAL REPORT]. A follow-up report prepared by the TFSC in October, 2011 indicated that the Texas State Fire Marshal's Office approved their earlier recommendations and is taking action on each of the recommendations in the *TFSC Final Report*, TEX. FORENSIC SCI. COMM'N, ADDENDUM TO THE APRIL 15, 2011 REPORT (Oct. 28, 2011), available at http://www.innocenceproject.org/docs/2011/Willingham_Willis_Addendum_2011.pdf [hereinafter TFSC ADDENDUM REPORT]. The recommendations include requirements that *NFPA 921*, *supra* note 150, and *NFPA 1033*, *supra* note 149, be followed in fire investigations.

A case in point about this rising awareness of the legal community is *Ficic v. State Farm Fire & Cas. Co.*¹⁹⁴ In that case, the insured plaintiff brought a claim against her insurance company for the loss of her car, which a fire destroyed while her brother was driving it on the roadway. At trial, the jury entered a verdict for the defendant insurance company, finding that the plaintiff had the fire “intentionally started in order to damage her property for the purpose of recovering on the insurance policy.”¹⁹⁵ The plaintiff brought a post-trial motion to set aside the jury verdict for the defense. The court conducted its own research, discovered *NFPA 921*, and then forwarded the relevant sections to counsel for both parties with a request that their experts submit comments by way of affidavit. In finding the evidence of the defense trial expert insufficient to sustain the verdict, the court was persuaded by the affidavit of the plaintiff’s expert, who concluded that the opinion of the defense expert at trial did not comport with *NFPA 921*. Therefore, the court struck the defense expert’s opinion from the trial record as being “invalid and clearly erroneous,”¹⁹⁶ set aside the jury verdict, and entered judgment for the plaintiff for an amount of \$34,000 plus interest and costs.¹⁹⁷

It is perhaps noteworthy that in reviewing this motion, the judge also noted the plaintiff’s lawyer did not conduct a *voir dire*¹⁹⁸ of the qualifications of the defendant’s fire investigation expert, nor did the lawyer object to this expert’s opinion testimony. It is even more noteworthy that the judge on the post-trial motion conducted his own research into the reliability of the defense expert’s opinion, and then having discovered the relevance of *NFPA 921*, asked for the experts on the post trial motion to address the pertinent provisions. While this decision is from 2005, pre-dating the *NRC/NAS Report*, it is an early indicator of the trend towards increasing scrutiny of fire experts using *NFPA 921*. Though this motion did not turn on the failure of the plaintiff’s trial counsel to challenge the admissibility of the defense expert, the court’s disdain regarding how this evidence was handled was implicit.

Not only does it appear that there is a growing awareness by the legal community about reliability concerns in fire investigations¹⁹⁹, public exposure is also on the rise.²⁰⁰ This may in turn bring

¹⁹⁴ 9 Misc. 3d 793 (Sup. Ct. 2005).

¹⁹⁵ *Ficic v. State Farm Fire & Cas. Co.*, 9 Misc. 3d 793, 797 (Sup. Ct. 2005).

¹⁹⁶ *Id.* at 802.

¹⁹⁷ *Id.* at 803–804.

¹⁹⁸ *Voir dire Definition*, BLACK’S LAW DICTIONARY (9th ed. 2009), available at Westlaw BLACKS (“2. A preliminary examination to test the competence of a witness or evidence.”). A *voir dire* may be a pre-trial motion or conducted during trial, without the presence of the jury.

¹⁹⁹ See, e.g. PAUL C. GIANNELLI, THE EXECUTION OF CAMERON TODD WILLINGHAM: JUNK SCIENCE, AN INNOCENT MAN, AND THE POLITICS OF DEATH, (AUGUST 26, 2011) available at http://works.bepress.com/paul_giannelli/2/ [hereinafter GIANNELLI, EXECUTION OF WILLINGHAM; Bruce L. Ottley, *Beyond the Crime Laboratory: The Admissibility of Unconfirmed Forensic Evidence in Arson Cases*, 36 NEW ENG. J. ON CRIM. & CIV. CONFINEMENT 263.

²⁰⁰ See, e.g., *20/20: Burned: Fire Scientist Questions Arson Finding*, Season 30 Episode 18 (ABC television broadcast) (May 7, 2010) available at <http://abc.go.com/watch/2020/166626/260464/fire-scientist-questions-arson-finding>; *Nightline: Wrongly Executed?* (ABC television broadcast) (Sept. 17, 2009) available at

pressure to bear on the justice system and legal community. Media coverage of the problems with fire investigations is mounting to the point that this issue even made its way into the plot of a popular TV show.²⁰¹

Escalating media coverage may also have an effect on jurors. Ignoring admonitions to the contrary, jurors sometimes conduct their own Internet research on issues relevant to the case, expanding their information beyond what is in evidence at trial.²⁰² While there are remedies to deal with juror misconduct, this growing public awareness may eventually leave an impression on potential jurors, rightly or wrongly making them more sensitive to fire investigation evidence. For example, one only needs to conduct an Internet search of the words “NAS Report” and “fire” to find a wealth of publications and videos across America relaying information about problems with fire and arson investigations resulting in wrongful convictions.²⁰³

Yet another force is evident in raising awareness of attorneys about frailties in the evidence of arson experts. Resources have now become readily available to help under-resourced attorneys mount credible *Daubert* challenges without having to conduct time-consuming and expensive research to learn how. To cite but one example, the National Association of Criminal Defense Lawyers has a series of documents available on their website, including a precedent motion for challenging the

<http://abcnews.go.com/video/playerIndex?id=8608644>; *Frontline: Death by Fire* (PBS television broadcast) (Oct. 19, 2010) available at <http://www.pbs.org/wgbh/pages/frontline/death-by-fire/>; *INCENDIARY: THE WILLINGHAM CASE* (Documentary, producers Joe Bailey Jr. & Steve Mims, 2011) available at <https://itunes.apple.com/us/movie/incendiary-willingham-case/id499126193>.

²⁰¹ *The Good Wife: Nine Hours* (CBS television broadcast) (Dec. 14, 2010) (Barry Scheck and the Innocence Project are featured, referring to the Cameron Todd Willingham arson case).

²⁰² See, e.g., Thaddeus Hoffmeister, *Google, Gadgets, and Guilt: Juror Misconduct in the Digital Age*, 83 U. COLO. L. REV. 409 (2012) (discussing, in part, the impact of jurors conducting research on the Internet during trials, and reporting the results of a limited survey soliciting some information on the extent of such conduct); Jeffrey T. Frederick, *You, the Jury, and the Internet*, 39-WTR BRIEF 12 (2012) (considering the problems posed by when jurors have ready access to outside information through the Internet that may influence their verdicts); George L. Blum, Annotation, *Prejudicial Effect of Juror Misconduct Arising from Internet Usage*, 48 A.L.R.6TH 135 (2012) (collecting cases dealing with the outcomes in criminal cases of juror misconduct in using the Internet). Cf. Jean E. Maess, Annotation, *Prejudicial Effect of Jury's Procurement or Use of Book During Deliberations in Criminal Cases*, 35 A.L.R.4TH 626 (2012) (examining the effect of juror misconduct in criminal cases when jurors have consulted during deliberations, books including textbooks, reference books, or pamphlets); Jean E. Maess, Annotation, *Prejudicial Effect of Jury's Procurement or Use of Book During Deliberations in Civil Cases*, 31 A.L.R.4TH 623 (2012) (examining the effect of juror misconduct in civil cases when jurors have consulted during deliberations, books not in evidence, including textbooks, reference books, or pamphlets).

²⁰³ The authors conducted a search of Google.com on January 17, 2014 and turned up numerous hits on the search phrase “‘NAS Report’ and ‘fire,’” linking to educational websites, newspaper articles across the United States, websites of members of the Innocence Network, and many more. Cf. Joseph L. Peterson & Anna S. Leggett, *The Evolution of Forensic Science: Progress Amid the Pitfalls*, 36 STETSON L. REV. 621, 649–52 (2007) (surveying investigative journalism's increasing role in exposing misconduct in laboratories).

admissibility of fire expert testimony using the *NRC/NAS Report* as ammunition.²⁰⁴ Lawyers wanting to educate themselves about the basics of fire investigations in preparation for dealing with fire experts in court have free access to short online trainings about almost every aspect of fire investigations through CFITrainer.net, as does anyone and everyone.²⁰⁵ With a little research at the library or online is it not difficult to find legal publications to bring one up to speed on issues in fire investigations.²⁰⁶

Case decisions using the *NRC/NAS Report* as a jumping off point also raise awareness about the problem. In one reported decision, a defendant convicted of capital murder applied for *habeas corpus* relief to the Texas Court of Appeals. He based his motion on the evidence of a medical examiner who was an expert witness for the prosecution at trial who subsequently changed her opinion respecting the victim's cause of death.²⁰⁷ Three of the seven-member court ruled that the defendant had not established his actual innocence according to Texas law and was therefore not entitled to a new trial. Notably, however, one judge, joined in his opinion by two other judges, dissented in the interests of justice, referring to the *NRC/NAS Report*.²⁰⁸ While this case did not involve a fire, it is interesting that of all of the forensic disciplines he could have selected to make his point, the analogy the judge used was to bad fire science:

In my view, this scientific uncertainty about [the victim's] cause of death raises an extremely serious concern about the accuracy of the original jury verdict. It is somewhat akin to a case in which the experts at an arson-murder trial expressed complete confidence that the fire that killed the victim was set intentionally and was the result of arson. But later, numerous other experts agree that, based on their review of the evidence and the science, no one can determine whether the fire was the result of arson or not. The cause of the fire was, in their current view, not capable of being scientifically determined as arson or accidental. It was a fire of "undetermined" and "undeterminable" origin. At trial, the experts may have been acting in perfect good faith and in accord with their current knowledge and level of expertise, but it turns out that they may have been entirely wrong. Or maybe not. Maybe it was homicide, maybe it was arson, but we do not know for certain. When scientific experts

²⁰⁴ *Notice of Motion and Motion to Exclude Testimony Regarding Arson Evidence Kelly-Frye*, NAT'L ASS'N OF CRIMINAL DEFENSE LAWYERS, www.nacdl.org/WorkArea/DownloadAsset.aspx?id=19046 (last visited Jan. 17, 2014) (motion to exclude evidence of burn patterns as indicative of the use of an accelerant in the absence of chemical testing, citing the *NRC/NAS REPORT* as authority in support of the motion).

²⁰⁵ CFITRAINER.NET, <http://www.cfitrainer.net/> (Jan. 17, 2014) (login required) (contains dozens of online training courses, many of which are based on *NFPA 921*, *supra* note 150, and *NFPA 1033*, and is available at no charge to anyone who registers to create an account).

²⁰⁶ *See, e.g.*, GIANNELLI, EXECUTION OF WILLINGHAM, *supra* note 199; Ottley, *supra* note 199; United States v. Hebshie, 754 F.Supp.2d 89, 114–115 (D. Mass. 2010) (listing public and professional publications about problems in fire investigations that were readily available to attorneys handling fire cases by 2006).

²⁰⁷ *Ex Parte Robbins*, 360 S.W.3d 446 (Tex.Crim.App., 2011) *reh'g denied* (Sept. 21, 2011), *cert. denied*, 132 S. Ct. 2374 (U.S. 2012) (3–4 decision).

²⁰⁸ *Id.* at 453 n.4 & 5, 471 n.9, 476 n.16 (*per* Cochran, J., dissenting, joined by Womack & Johnson, JJ.).

honestly and sincerely thought “X” was true at the time they testified, but the science has changed or the experts’ understanding of the science has changed and their opinions have changed, what cognizance of that change should the criminal justice system take long after a person has been convicted?²⁰⁹

What is interesting is the fact that an appellate judge made this analogy to frailties of fire science in arson cases, rather than to any of the other forensic sciences set forth in so much more detail and criticized heavily in the *NRC/NAS Report* such as fingerprinting or the analysis of bite marks. We take this as yet another sign that concerns about faulty arson investigations are coming to the fore.

Even more to the point is what the law considers as the prevailing professional norms for attorneys handling fire cases. To what extent does the professional standard of care for attorneys handling fire litigation require that they know about *NFPA 921* or the *NRC/NAS Report* or that they take appropriate action to exclude or limit the evidence of fire experts under *Daubert*?

A particularly striking answer to this question comes from a United States district court decision in a criminal case, *United States v. Hebshie (Hebshie)*, where *NRC/NAS Report* in hand, a federal district court judge sets the tone for both investigators and attorneys with respect to scientific validity and reliability of fire investigation evidence.²¹⁰ By way of background, the defendant James Hebshie was convicted in 2006 of arson for setting a 2001 fire that destroyed his convenience store in Taunton, Massachusetts, and he was also convicted for mail fraud respecting his subsequent insurance claim. While serving a mandatory 15-year prison sentence, and having exhausted all appeals, he brought a petition for a writ of *habeas corpus*²¹¹ to vacate his conviction, which was the subject of this decision.

The basis of the defendant’s motion was the ineffective assistance of his two trial lawyers, primarily based on their handling of the scientific testimony of arson. To obtain the conviction, the state was obliged to prove that the fire in the defendant’s store was incendiary—intentionally set, not accidental—and that the defendant was the one who set it.²¹² To show the fire was incendiary, the prosecution relied on an origin and cause expert who testified about the area where the fire began and its cause. The prosecution also offered evidence of a canine handler whose “accelerant detection dog”²¹³ alerted to a spot in the store where a sample was taken; and the evidence of the laboratory technician whose tests were offered as proof that accelerants were present. To prove that the

²⁰⁹ *Id.* at 469 (*per* Cochran, J., dissenting, joined by Womack & Johnson, JJ.).

²¹⁰ 754 F.Supp.2d 89 (D. Mass. 2010).

²¹¹ *Habeas corpus Definition*, BLACK’S LAW DICTIONARY (9th ed. 2009), available at Westlaw BLACKS (“A writ employed to bring a person before a court, most frequently to ensure that the person’s imprisonment or detention is not illegal.”).

²¹² *United States v. Hebshie*, 754 F.Supp.2d 89, 92 (D. Mass. 2010).

²¹³ *Id.* at 96–97, 109–110, 119–120 (“Billy was identified as an ‘accelerant–detection’ dog, as if the substance she identified—‘light petroleum distillate’—was necessarily associated with arson fires; it was not.” *Id.* at 119.)

defendant was the one who set the fire, the state relied on evidence of financial motive, the defendant's desire to sell the store, and his claim for the insurance proceeds from the fire.²¹⁴

There were two central issues in the Hebshie decision. First, whether the defendant suffered prejudice due to ineffective assistance of counsel, and if so, whether there was a reasonable probability that the trial would have resulted differently had counsel done their job adequately.²¹⁵ It is in considering this first issue that the judge reviewed what level of awareness reasonable trial counsel in an arson case should have respecting the *NRC/NAS Report* and *NFPA 921*. We will return to this issue shortly.

The second issue was whether defense counsels' failure to challenge the validity or reliability of the evidence of the origin and cause expert, the canine handler, and the laboratory technician, through pre-trial *Daubert* hearings, objections at trial, in closing argument, or otherwise, affected the trial's outcome. The 39-page decision goes into extensive detail about the validity and reliability concerns with the evidence of each of these witnesses. The court relies heavily on *NFPA 921* in evaluating the reliability of the expert testimony, finding all three categories deficient when measured by *NFPA 921*.²¹⁶ Ultimately, the court determined that the trial defense counsel should have moved for exclusion of this evidence under *Daubert*.²¹⁷

What counsel did not do is to move for a *Daubert* hearing prior to trial on any expert issue. They did not seek exclusion of any of the proposed expert testimony which was the core of the arson case, or move for its limitation. They did not argue that the expert testimony failed to meet the minimal threshold for reliability of scientific evidence in *NFPA 921* and should not have been admitted at all. They did not alert the Court to the ways in which the government's investigation undermined their very ability to present a defense.²¹⁸ [Emphasis added.]

Daubert motions would likely have been effective in excluding or limiting this evidence. Because of these failures by defense counsel, the defendant was prejudiced.²¹⁹

The next issue that the Hebshie court addressed was whether defense counsel's failure to apprise himself of reliability issues and to bring appropriate *Daubert* challenges amounted to ineffective counsel, entitling the defendant to a new trial. To establish a claim of ineffective assistance of counsel, the defendant in this case had to prove, "(1) that his counsel's performance was deficient

²¹⁴ *Id.* at 92.

²¹⁵ *Id.* at 95

²¹⁶ *Id.* at 109–112, 117–119, 121–126.

²¹⁷ *Id.* at 115–119, 120–122.

²¹⁸ *Id.* at at 111.

²¹⁹ *Id.* at 95.

and (2) that he suffered prejudice as a result.”²²⁰ In order to show counsel’s performance was deficient, the “attorney’s conduct must fall below an ‘objective standard of reasonableness’ established by ‘prevailing professional norms.’”²²¹ The law presumes counsel’s performance is reasonable.²²² Among lawyers, it is well known that it is very difficult to establish that a trial lawyers’ performance is deficient when dealing with the typical strategic decisions made by counsel at trial.²²³ Interestingly, the Hebshie court concluded that, “scientific and expert evidence raises fundamentally different questions, and impose a different set of obligations.”²²⁴ Much of the reasoning related to counsel’s obligations to apply for a hearing on unreliable expert testimony under *Daubert*.

The ruling by the trial court on this issue is instructive on the increasing awareness, not only in the legal community, but also by the public at large, about problems in fire investigations. In finding that challenging the origin and cause, canine, and laboratory evidence in a *Daubert* motion was within the “prevailing professional norms,”²²⁵ the trial judge reviewed the level of awareness expected of attorneys handling such cases. We quote here at length from the decision, because it is a groundbreaking approach, and while this decision is not binding on any other court, the judge who rendered this decision is a rising star in the legal community, as we will see later:

By 2006, when Hebshie was tried, the public and professional literature reflected increasing scrutiny of arson evidence by experts in both the scientific and legal fields as well as by the public at large. While counsel need not read every article pertaining to the subject at hand, he must “keep[] abreast of current legal literature and developments.” Model Code of Prof’l Responsibility EC 6-2 (1980); see also *Strickland*, 466 U.S. at 688, 104 S.Ct. 2052 (“Prevailing norms of practice as reflected in American Bar Association standards ... [are] ‘guides to determining what is reasonable.’ ”)^{FN45}

FN45. Indeed, in the early 2000s, there were two cases in this Circuit that raised the question of defense counsel’s effectiveness in an arson case. See *Dugas v. Coplan*, 428 F.3d 317, 342 (1st Cir.2005) (remanding for a hearing on the question of whether counsel was ineffective in not obtaining an arson expert); *United States v. Correia*, 77 Fed.Appx. 12 (1st Cir.2003), *aff’d* No. 00-10246-RWZ, 2002 WL 31052766 (D.Mass. Sept. 13, 2002) (affirming the trial court’s decision to grant a new trial based on counsel’s ineffectiveness in not obtaining a defense arson expert, and failing to pursue other defense avenues).

Popular legal casebooks, such as David L. Faigman et al., *Science in the Law: Forensic Science Issues* (2002), highlighted problems in many cause-and-origin techniques. In addition,

²²⁰ *Id.* at 92 (citing *Strickland v. Washington*, 466 U.S. 668, 687 (1984)).

²²¹ *Id.* (citing *Strickland*, 466 U.S. 687-688).

²²² *Id.* at 112, (citing *Strickland*, 466 U.S. 691).

²²³ *Id.* at 92.

²²⁴ *Id.*

²²⁵ *Id.* at 95, 114.

in the early 2000s, several reports and articles were published that impugned arson investigatory techniques as well as forensic evidence more generally. Notably, in 2005 Congress passed legislation calling for a review of forensic evidence. See Science, State, Justice, Commerce, and Related Agencies Appropriations Act of 2006, Pub. L. No. 109–108, 119 Stat. 2290 (2005).^{FN46} Even the popular press reported on the concerns raised by forensic evidence. The *Chicago Tribune* ran a series of such articles in 2004, “Forensics Under the Microscope.” This series included an exposé on arson evidence. Def.’s Mem. Supp. 2255 Pet. Mot. New Trial Ex. D (Maurice Possley, *Arson Myths Fuel Errors*, Chi. Trib., Oct. 18, 2004) (document # 137–5).^{FN47}

FN46. This legislation resulted in the 2009 National Academy of Sciences Report, “Strengthening Forensic Science in the United States: A Path Forward,” that questioned the reliability of forensic evidence used in courts across the country.

FN47. Just a few months before Hebshie’s trial began; the Innocence Project Arson Review Committee released its report excoriating the suspect “science” used to convict Cameron Todd Willingham and Ernest Ray Willis of arson and murder. Arson Review Committee, Innocence Proj. *Report on the Peer Review of the Expert Testimony in the Cases of State of Texas v. Cameron Todd Willingham and State of Texas v. Ernest Ray Willis* (2006) (Mem. in Support Ex. A (document # 137–1)).

Finally, case law raised concerns about arson expert testimony similar to the concerns raised in this investigation. See, e.g., *Fireman’s Fund Ins. Co. v. Canon U.S.A., Inc.*, 394 F.3d 1054, 1058 (8th Cir.2005) (holding district court’s exclusion of expert arson evidence proper where experts failed to compare hypothesis to evidence from scene in violation of NFPA 921); *Mich. Millers*, 140 F.3d at 920 (finding no abuse of discretion where trial court excluded arson expert’s testimony because his methodology did not support his conclusion); *Ind. Ins. Co. v. Gen. Elec. Co.*, 326 F.Supp.2d 844, 850–51 (N.D. Ohio 2004) (holding that cause-and-origin expert’s failure to properly collect evidence, in violation of NFPA 921, Section 9–5.1, “Documenting the Collection of Physical Evidence,” made his investigation unreliable.); *Am. Family Ins. Grp. v. JVC Am. Corp.*, No. 00–27 DSD/JMM, 2001 WL 1618454, at *3–4 (D.Minn. Apr. 30, 2001) (excluding expert testimony where expert did not apply methodology recommended by NFPA).²²⁶

In the end the court ruled that Hebshie’s trial counsel’s representation fell below the reasonable standard, and the *habeas corpus* petition was granted.

One who carefully reads the above excerpts will see that the *Hebshie* court has gone even further than we have. While we have postulated that the level of awareness of issues with the reliability of fire investigations is growing, we did not go so far as to say that counsel in a fire case has a positive duty to learn about these issues. The *Hebshie* court did, finding a positive duty on counsel to keep “abreast of current legal literature and developments.”²²⁷ In the context of fire investigations the *Hebshie* court has interpreted this to mean that attorneys should apprise themselves of the problems with forensic sciences as set out in the *NRC/NAS Report*, as well as case law and literature

²²⁶ *Id.* at 114–115.

²²⁷ *Id.* at 114 (citing the Model Code of Prof’l Responsibility EC 6–2 (1980)).

dealing with reliability issues in fire investigations and the *NFPA 921* methodologies. According to the *Hebshie* court, even the work of the Innocence Project and TFSC are within the realm of information readily available for attorneys to keep themselves current on fire investigation matters.

To summarize, for all of the reasons stated in this subsection, we anticipate that a new round of *Daubert* challenges is evolving. Judges, attorneys, the media, and members of the public will bring pressure to bear, raising the bar for what is required of counsel in handling a fire case, whether civil or criminal. *Daubert* challenges will be the rule, rather than the exception, in criminal as well as civil cases. Even in non-*Daubert* jurisdictions, *voir dire*s challenging expert qualifications, if not reliability issues, will escalate.²²⁸ The proliferation of publications and trainings²²⁹ continue to make strategies on how to use *NFPA 1033* and *NFPA 921* in court more accessible for experts, attorneys, and judges. Combine these pressures with those created by the 2014 editions of both documents, and it is reasonable to expect a new level of scrutiny for fire experts under *Daubert*. It is also reasonable to expect a proliferation of new strategies in courtroom advocacy using these documents, the *NRC/NAS Report*, the TFSC reports,²³⁰ and related authorities.

8.5. THE HEIGHTENED ROLE OF *NFPA 1033* AND *NFPA 921* IN THE COMING STORM

One might think that the threat posed to fire experts by *Daubert* and its state equivalents is old news. Sure, in the mid-to-late 1990s the fire investigation community was in an uproar over *NFPA 921* and how attorneys used it as a sword to get the testimony of fire experts excluded. Eventually most fire investigators adapted. There are now publications and training opportunities providing strategies to handle *Daubert* challenges involving *NFPA 921*. As for *NFPA 1033*, it has never amounted to much of an ordeal in terms of *Daubert*. Therefore, why do we now anticipate that these documents will have a heightened role in the coming storm? In short, it is because growing media hype concerning the problems with forensic sciences and wrongful convictions has raised the awareness about faulty fire investigations several notches. In responding to the challenge of how to fix these problems, the authorities consistently and unwaveringly point to the need for mandatory certification and adherence to standards. For fire investigators, these fingers point to *NFPA 1033* and *NFPA 921*.

Examples of recommendations that certification, such as that offered to fire investigators under *NFPA 1033*, and standards such as *NFPA 921*, provide at least part of the fix as explained earlier in Part I of this article. In summary:

²²⁸ For example, *Ficic v. State Farm Fire & Cas. Co.*, 9 Misc. 3d 793, 797 (Sup. Ct. 2005), is a case out of New York state, which is not a *Daubert* jurisdiction, but the judge clearly implied that a *voir dire* on the expert's qualifications would have been in order.

²²⁹ See, e.g., CFITRAINER.NET, <http://www.cfitrainer.net/> (Jan. 17, 2014) (login required); *Training Opportunities*, INT'L ASS'N OF ARSON INVESTIGATORS (2014), <http://firearson.com/training-opportunities>; *Training Events*, NAT'L ASS'N OF FIRE INVESTIGATORS (2014), <http://www.nafi.org/training/>; *Training Schedule*, PUBLIC AGENCY TRAINING COUNSEL, <http://www.patc.com/training/schedule.php> (last visited Jan. 17, 2014).

²³⁰ See Parts I and II of this article, and the brief overview *supra* note 193

- Recommendations in the *NRC/NAS Report* include implementing mandatory certification of forensic science practitioners²³¹ and that practitioners comply with industry standards that reflect the best practices in their fields.²³² Although this report addresses fire scene investigations only peripherally, fire investigators have been brought under its umbrella and will feel its impact.²³³
- In Texas, the TFSC recommends²³⁴ that “fire investigators adhere to the standards of NFPA 921,” enhance their certification, and comply with *NFPA 1033*, including mandatory requirements that the investigator must maintain a minimum basic knowledge, beyond the high school level, of the 13 topics [now 16 topics] listed in *NFPA 1033*, covering a broad range of topics fire science and explosion dynamics, to fire investigation methodology and failure analysis.²³⁵ The Texas State Fire Marshal’s Office has endorsed these recommendations as appropriate and is undertaking their implementation.²³⁶
- The Oklahoma State Senate passed a resolution urging “the judicial branch, law enforcement agencies and other relevant government entities in Oklahoma to employ NFPA 921 when conducting fire investigations.”²³⁷

As noted in the last section of this article, within the legal community, academic and professional journal articles are on the rise respecting the problems with fire investigations and the need to use *NFPA 921* and *NFPA 1033*.²³⁸ Attorneys, in turn, will expect fire experts whose evidence they will call to be prepared to justify their investigations based on these two standards.

Some of the case reports that deal specifically with fire investigations provide a prototype of how *Daubert* challenges can be launched or handled. On one hand, the comments in the *NRC/NAS Report*

²³¹ NRC/NAS REPORT, *supra* note 53, at 25.

²³² NRC/NAS REPORT, *supra* note 53, at 23–25.

²³³ NRC/NAS REPORT, *supra* note 53, at 172–3 (*citations omitted*). See also Part I, section 2.2.

²³⁴ TFSC FINAL REPORT, *supra* note 193, at 39–41.

²³⁵ NFPA 1033 (2009 ed.), *supra* note 149, § 1.3.8. See Part II of this paper for a discussion of the expansion of this “list of 13,” to a “list of 16” in the 2014 edition, and the implications of these and other proposed changes to *NFPA 1033* for use in the courtroom.

²³⁶ TFSC ADDENDUM REPORT, *supra* note 193, at 5.

²³⁷ S.R. 99, (Okla. 2010), available at <https://www.sos.ok.gov/documents/legislation/52nd/2010/2R/SR/99.pdf>.

²³⁸ Paul C. Giannelli & Kimberly Gawel, *Arson Evidence*, 47 No. 6 CRIM. LAW BULLETIN ART 8, 8 (“Arson investigations continue to come under attack.”); Caitlin Plummer & Imran Syed, “*Shifted Science*” and *Post-Conviction Relief*, 8 STAN. J. CIV. RTS. & CIV. LIBERTIES 259, 261 (2012) (“While the following discussion applies broadly to many categories of science-based convictions, we draw most of our examples and knowledge from the field of wrongful convictions based on outdated arson science.”); Marc Price Wolf, *Habeas Relief from Bad Science: Does Federal Habeas Corpus Provide Relief for Prisoners Possibly Convicted on Misunderstood Fire Science?*, 10 MINN. J.L. SCI. & TECH. 213 (2009).

about fire pattern interpretation can precipitate a *Daubert* challenge, which, in turn *NFPA 921* can offset. Take, for example, the 2010 federal district court decision in *US v. Aman*:

Defendant points out that in 2009, the National Research Council of the National Academy of Sciences published a report criticizing, among other forensic fields, arson investigation. See *Nat'l Research Council, Strengthening Forensic Science in the United States: A Path Forward*, at 173 (2009) (“NRC Report”) (noting, *inter alia*, that “much more research is needed on the natural variability of burn patterns and damage characteristics and how they are affected by the presence of various accelerants”). As an initial matter, the NRC Report does not recommend barring fire investigators from offering opinions in court based on the use of the *NFPA 921* methodology. Moreover, while an important contribution to the evaluation of numerous forensic fields, the report does not bind federal courts. In any event, although the NRC sensibly suggests that further development of the principles and methods of fire investigation would improve the precision of such experts' findings, the NRC's critique does not change the result that, for all of the reasons already stated, the *NFPA 921* methodology is sufficiently reliable to withstand *Daubert* scrutiny.²³⁹ . . .

As this case shows, and as many fire experts learned well before the publication of the *NRC/NAS Report*—referred to above as the *NRC Report*,—*NFPA 921* can provide an effective shield to a motion to preclude their testimony under *Daubert*.

On the other hand, with the new age of *Daubert* scrutiny of forensic evidence heralded by the *NRC/NAS Report*, woe betide those fire investigation experts who cannot pass muster under *NFPA 921* or some equally well accepted authoritative reference. Further, some now expect lawyers to be cognizant of reliability troubles in fire investigations and to take action to exclude unreliable evidence, using *Daubert* or whatever other means the law makes available.

The *Hebshie* decision summarized earlier provides a case in point. The court found that there were considerable problems with the evidence of the canine handler and laboratory analyst that went to the heart of the state's proof that the fire in Hebshie's convenience store was incendiary:

Once . . . the dog sniffed a so-called accelerant in the left side of Hebshie's store, the area to which she had been led (the very area that [the origin and cause expert] concluded was where the fire started), government experts never checked other areas for “accelerants.” They took no control or comparison samples from anywhere else, as the scientific method and arson investigation standards suggest. That single sample was then tested and found to be “light petroleum distillate.” “Light petroleum distillate,” however, is a category so broad that a host of entirely benign substances fit within it, especially in this case. Hebshie's store was a convenience store, after all; light petroleum distillate could be found in a number of the goods he offered for sale (lighter fluid or lighters, for example). In addition, it was a substance generated by the heat of the fire itself, a product of pyrolysis of other materials in the store (like carpet glue). In fact, the laboratory test was only probative of arson if one area tested positive while others did not, or if the test disclosed a chemical that would not normally be

²³⁹ *United States v. Aman*, 748 F. Supp. 2d 531, 536 (E.D. Va. 2010).

present at the scene. Nevertheless, the sample was never analyzed further.²⁴⁰ (Footnotes omitted.)

....

[The] dog handler . . . was permitted to testify to an almost mystical account of [the dog]'s powers and her unique olfactory capabilities. He presented unsubstantiated claims about the dog's accuracy. He was allowed to go on at great length about his emotional relationship with the dog and his entirely subjective ability to interpret her face, what she thought, intended, and the "strength" of the alert she gave in this case. Finally, [the dog handler] was permitted to testify that the dog did not alert to anything else on the premises, as if the dog had been allowed to range widely on the fire scene (*she was not*), and as if the dog's failure to alert had evidential value (*it does not*).²⁴¹

In assessing this evidence, the court noted that the defense expert had alerted defense counsel to sections of *NFPA 921* that should have raised great concerns with this testimony, but in the face of this advice, the defense failed to apply for a *Daubert* hearing.

With respect to the origin and cause evidence and the expert's investigation and interpretation of fire patterns, the counsel in the defendant's *habeas corpus* hearing submitted that the trial defense counsel failed sufficiently to deal with this evidence, which did not follow the scientific method. The prosecution's origin and cause expert concluded that the fire started in the defendant's store. A reasonable alternate hypothesis was either that the fire started in the basement, or if it started where the origin and cause expert said it did, then it was caused by the accidental ignition of products typically found in a convenience store.²⁴²

Here are the main concerns about the origin and cause expert's testimony as identified by the court in the *habeas* motion:

- The origin and cause expert concluded that the fire originated in the basement, however, he did not take any photographs in the basement, and his investigation reports did not indicate he had even been in the basement, nor did they even mention the basement.²⁴³
- He did not document or preserve the scene in a manner that allowed others, including defense experts, to test his conclusions before the building was completely demolished.²⁴⁴

²⁴⁰ United States v. Hebshie, 754 F.Supp.2d 89, 93 n.6 (D. Mass. 2010) (defining "pyrolysis" as "a chemical change brought about by the action of heat.").

²⁴¹ *Id.* at 93–94.

²⁴² *Id.* at 94.

²⁴³ *Id.* at 94, 101, 101 n.14.

²⁴⁴ *Id.* at 94.

- He directed the canine handler to the area he wanted evaluated, the most intact part of the building, without having the canine scan other areas or have samples collected elsewhere in the building.²⁴⁵
- He confirmed his theory of the area where the fire originated by observations and interpreting burn patterns:

He pointed to the “heavy damage and charring,” a “low burn or area that was damaged close to the bottom of the floor level,” and a “V” pattern on the wall above the hypothesized origin of the fire. [He] ruled out the basement as the origin of the fire (although . . . nothing in any of his reports reflected that he had even been there.) (Footnotes and transcript citations omitted.)²⁴⁶

- And yet on cross-examination, the origin and cause expert agreed with a number of facts that would contra-indicate that he correctly identified the area where the fire originated:

[T]he area he had identified as the most damaged was in fact an area where sections of the wall were most intact, and where even the flimsy paneling had not been burned through, nor had a stack of papers, or nearby plastic bags. He also acknowledged that the most damaged area may not be the area where the fire started because the burn pattern may be affected by other factors, which could also lead to false identification of cause-and-origin. For example, “V” patterns can be caused by factors having nothing to do with the fire’s origins-ventilation or the fact that some materials burn more easily. In fact, he agreed that there was no real “V” in the picture at all. He conceded that there was significant burning in the stairwell area leading to the basement. . . .²⁴⁷

In assessing the evidence of the prosecution expert on the canine alert and the conclusions drawn from laboratory analysis that purportedly indicated the presence of accelerants, the court relied heavily on *NFPA 921*. The defense expert had drawn defense counsels’ attention to sections of *NFPA 921* that should have raised great concerns with this testimony, but in the face of this warning, the defense failed to apply for a *Daubert* hearing. Here are excerpts from the court’s summary of the sections of *NFPA 921* relevant to the above testimony:

NFPA 921 circumscribes the use of canines; they are meant simply to be tools to help investigators narrow the search area for ignitable liquids. *NFPA 921* § 14.5.3.5 (“Canine ignitable liquid detection should be used in conjunction with, and not in place of, the other fire investigation . . . methods”); *id.* (“The proper objective of the use of canine/handler teams is to assist with the selection of samples that have a higher probability of laboratory confirmation than samples selected without the canine’s assistance.”). . . . And [the defense expert] especially underscored the prejudice of allowing the testimony to be described as

²⁴⁵ *Id.*

²⁴⁶ *Id.* at 100.

²⁴⁷ *Id.* at 100–101.

“accelerant detecting.” What investigators refer to as “accelerants” actually represent a wide range of common and frequently benign materials. In addition, such chemicals can be created by the breaking down of materials during a fire, such as decomposing carpet and other adhesives. “Unlike explosive-or drug-detecting dogs, these canines are trained to detect substances that are common to our everyday environment... [M]erely detecting such quantities is of limited evidential value.” NFPA 921 § 14.5.3.5. For these reasons, NFPA 921 requires not just laboratory corroboration, but also comparison samples. *Id.* And it emphasized concerns about the canine's reliability—false positives and false negatives. *Id.* at § 14.5.35²⁴⁸ (Footnotes omitted.)

Further, the court cited *NFPA 921* § 14.5.3.4 to demonstrate the need for comparison samples for the laboratory analysis in the circumstances:

The collection of comparison samples is especially important in the collection of materials that are believed to contain liquid or solid accelerants. For example, the comparison sample for physical evidence consisting of a piece of carpeting believed to contain a liquid accelerant would be a piece of the same carpeting that does not contain any of the liquid accelerant. Comparison samples allow the laboratory to evaluate the possible contributions of volatile pyrolysis products to the analysis and also to estimate the flammability properties of the normal fuel present.²⁴⁹

NFPA 921 was also featured as the court assessed the origin and cause evidence, noting the failure to take comparison samples, and to document the investigation of the basement:

Making matters worse, the investigator's failure to collect additional samples was compounded by the razing of the building. The defense had no way to contest the significance of the laboratory test. They were entirely dependent on the government's limited investigation. *See NFPA 921* § 14.3 (“Every attempt should be made to protect and preserve the fire scene as intact and undisturbed as possible.... Generally, the cause of a fire or explosion is not known until near the end of the investigation ... As a result, the entire fire scene should be considered physical evidence and should be protected and preserved.”)²⁵⁰

The depths to which the judge in *Hebshie* assessed the expert evidence using *NFPA 921* is remarkable. However, if fire investigators can expect, as we predict, a higher level of scrutiny under *Daubert* and *NFPA 921* and *NFPA 1033* for all of the reasons cited here, a *Hebshie*-style in-depth analysis might well become the norm.

Naysayers can readily contest our position and may want to downplay the importance of *Hebshie*. Certainly *Hebshie* is not a binding precedent, coming as it does from a federal district court rather than an appeal court. Further, since the judge who decided this case, The Honorable Nancy Gertner,

²⁴⁸ *Id.* at 110–111.

²⁴⁹ *Id.* at 111.

²⁵⁰ *Id.* at 123–124.

has since retired from the bench a reasonable assumption might be that her say on matters of fire investigations or *Daubert* is at an end.

However, in our view, this decision is pivotal. It sets forth the standard for attorneys defending their clients from charges of fire crimes, pointing to the *NRC/NAS Report* and *NFPA 921* and the necessity to wrestle with reliability issues using *Daubert*. It is exceedingly well reasoned and will be easy for future lawyers, fire experts, and judges, to use as a template for *Daubert* challenges in fire cases.

What is more, Judge Gertner is likely to continue to be influential in this area. She has already established herself as a prolific writer.²⁵¹ In her time as a federal court judge, she has distinguished herself as influential in forensic science and *Daubert* matters,²⁵² and she has risen to a high level of respect among heavyweights in the field of scientific evidence,²⁵³ being acknowledged as “a nationally recognized voice who has been outspoken about taking the *NAS Report* seriously.”²⁵⁴ Another major player in the scientific evidence field, law Professor Paul C. Giannelli, in writing a literature review on the *NRC/NAS Report* observed of Judge Gertner that she “has written more groundbreaking decisions in forensic science than any other jurist.”²⁵⁵ Finally, Judge Gertner is now a Professor of Practice at Harvard Law School, where one might reasonably expect her national influence to expand even more. Her rallying cry is for a more rigorous application of *Daubert*, noting as she has that, “the *NAS Report*’s concerns will not be fully met until advocacy changes.”²⁵⁶

²⁵¹ See, Nancy Gertner, *Professor of Practice*, HARVARD LAW SCHOOL, <http://www.law.harvard.edu/faculty/directory/index.html?id=953> (last visited Jan. 17, 2014) (listing her authorship of books, chapters within books, periodical articles, and judgments.).

²⁵² See, e.g., Nancy Gertner, *National Academy of Science Report: A Challenge to the Courts*, 27 CRIM. JUST. 8 (2012); Nancy Gertner, *Commentary on the Need for a Research Culture in the Forensic Sciences*, 58 UCLA L. REV. 789 (2010-2011); Procedural Order: Trace Evidence No. 1:08-cr-10104-NG (D. Mass. Mar. 8, 2010), available at <http://tinyurl.com/7pv2jhf>.

²⁵³ Myrna S. Raeder, *Introduction to Forensic Science Symposium*, 27-SPG CRIM. JUST 4, 6 (Spring 2012) (introducing Judge Nancy Gertner at a forensic science symposium as, “a nationally recognized voice who has been outspoken about taking the NRC/NAS Report seriously.”); Paul C. Giannelli, *The 2009 NAS Forensic Science Report: A Literature Review*, 48 NO. 2 CRIM. LAW BULLETIN ART 6 (2012) [hereinafter Giannelli, *NRC/NAS Report Literature Review*] (observing that “Judge Nancy Gertner, who has written more groundbreaking decisions in forensic science than any other jurist, noted that ‘the NAS Report’s concerns will not be fully met until advocacy changes.’” (citations omitted)).

²⁵⁴ Raeder, *supra* note 253, at 6.

²⁵⁵ Giannelli, *NRC/NAS Report Literature Review*, *supra* note 253, (citing *U.S. v. Hebshie*, 754 F. Supp. 2d 89, 113–15 (D. Mass. 2010) (evaluating the admissibility of arson evidence); *U.S. v. Green*, 405 F. Supp. 2d 104, 109 (D. Mass. 2005) (considering the reliability and admissibility of toolmark evidence); *U.S. v. Hines*, 55 F. Supp. 2d 62, 67–68, 52 Fed. R. Evid. Serv. 257 (D. Mass. 1999) (analyzing the admissibility of expert evidence on handwriting comparison)).

²⁵⁶ Giannelli, *NRC/NAS Report Literature Review*, *supra* note 253 (citing Nancy Gertner, *Commentary on the Need for a Research Culture in the Forensic Sciences*, 58 UCLA L. REV. 789, 790 (2011).)

But will advocacy change? Looking at the TFSC recommendations,²⁵⁷ one might well be satisfied that between *NFPA 1033*, *NFPA 921*, and the other authorities cited there, well-educated fire experts who are articulate in their reports and on the witness stand have nothing to fear. Then again, a closer reading of the *NRC/NAS Report*, together with a heightened understanding of how it might apply to fire investigations, discloses heretofore little explored reliability issues in this field. These issues are the degree to which fire scene investigation relies on the subjective human interpretation of fire effects and fire patterns and could be unreliable due to error, bias, or even a lack of knowledge or experience. We address issues of subjectivity and bias as raised in the *NRC/NAS Report* next.

8.6. SUBJECTIVITY AND BIAS

On April 3, 2009, the Honorable Judge Harry Edwards, co-chair of the committee who prepared the *NRC/NAS Report*, delivered the keynote address to the *Conference on Forensic Science for the 21st Century: The National Academy of Sciences Report and Beyond*.²⁵⁸ In his speech, he captured the essence of sound scientific evidence:

Good science includes two attributes that the law needs from the forensic disciplines: (1) valid and reliable methodologies that enable the accurate analysis of evidence and reporting of results and (2) *practices that minimize the risk of results being dependent on subjective judgments or tainted by error or the threat of bias*.²⁵⁹ . . . [Emphasis added.]

To the extent that the *NRC/NAS Report* has heightened the awareness of the problems with forensic science and the courts' handling of reliability issues, it points the way for attorneys and judges to delve more deeply into reliability issues without their having to undertake time-consuming research. Some of these issues are raised in the *NRC/NAS Report* in one context, which one can readily apply by analogy to fire investigations. Bias is one such example. The *NRC/NAS Report* repeatedly raises bias as a substantial issue.²⁶⁰

The threat of bias is particularly problematic for those forensic disciplines which rely on human interpretation and are therefore subjective, or which are largely dependent on the level of the expert's experience. With respect to inherent problems with subjective assessments, the *NRC/NAS Report's* conclusions on fingerprint analysis are instructive and one can raise similar concerns about fire pattern interpretation. Professor Paul C. Giannelli, a venerable professor of law and author of

²⁵⁷ See TFSC Final Report, *supra* note 193, and the TFSC Addendum Report, *supra* note 193. See Part I of this article for further detail.

²⁵⁸ Harry T. Edwards, *Solving the Problems That Plague the Forensic Science Community*, 50 JURIMETRICS J. 5, 13(2009).

²⁵⁹ Edwards, *supra* note 258.

²⁶⁰ See, e.g., NRC/NAS REPORT, *supra* note 53, at 122–124, 149 (“it is difficult to avoid biases in experience-based judgments”); *Id.* at 184 (“Few forensic science methods have developed adequate measures of the accuracy of inferences made by forensic scientists. All results for every forensic science method should indicate the uncertainty in the measurements that are made . . .”).

numerous books and articles on scientific evidence nicely summarized this aspect of the *NRC/NAS Report* in this way:

The report added that “[t]he latent print community in the United States has eschewed numerical scores and corresponding thresholds” and consequently relies “on *primarily subjective criteria*” (*NAS Report*, at 141) in making the ultimate attribution decision. In making the decision, the *examiner must draw on personal experience* to evaluate numerous factors, including the inevitable variations in pressure, but to date those factors have not been “characterized, quantified, or compared.” (*NAS Report*, at 144)[Emphasis added.]²⁶¹

When one explores the practice of fire scene examination and the interpretation of fire effects or patterns, it is apparent that these are based on human interpretations, which by their very nature are subjective. The above quote talks about the “numerous factors” that must be evaluated in order to make a decision about a finger print. The same is true of making decisions about where a fire originated or determining its cause, particularly where the fire damage is substantial or flashover²⁶² has occurred. Just read *NFPA 921*’s chapters on “Basic Fire Science,”²⁶³ “Fire Patterns,”²⁶⁴ “Origin Determination,”²⁶⁵ and “Fire Cause Determination”²⁶⁶ to fathom the vast array of factors that an investigator should consider when using fire pattern interpretation to identify the area of fire origin or, more specifically, to determine the cause of a fire.

While the science underlying this process may have been objectively developed, the process of applying the scientific foundations to any given fire scene is a subjective process affected by the knowledge, skills, and experience of the investigators. And while *NFPA 921* was designed to help people to investigate and analyze fires, it may not be enough, as *NFPA 921* cautions its readers:

1.3.5 This document is not intended as a comprehensive scientific or engineering text. Although many scientific and engineering concepts are presented within the text, *the user is*

²⁶¹ Giannelli, *NRC/NAS Report Literature Review*, *supra* note 253, at 3.

²⁶² *NFPA 921*, 2014 edition, *supra* note 150, defines flashover as, “A transition phase in the development of a compartment fire in which surfaces exposed to thermal radiation reach ignition temperature more or less simultaneously and fire spreads rapidly throughout the space, resulting in full room involvement or total involvement of the compartment or enclosed space.” *NFPA 921* (2014 ed.), *supra* note 150, § 3.3.83. A layperson’s definition of flashover is, “2. The temperature point at which the heat in an area or region is high enough to ignite all flammable material simultaneously.” *Flashover Definition*, THE AMERICAN HERITAGE® DICTIONARY OF THE ENGLISH LANGUAGE (4th ed. 2000, updated 2009) available at <http://www.thefreedictionary.com/flashover>. Information on fire behavior, including flashover is available from the National Institute of Standards and Technology. NIST, *Fire Behavior*, http://www.nist.gov/fire/fire_behavior.cfm (last updated Jul. 16, 2013). A series of videos depicting the flashover phenomenon are also available through a link on this NIST web page at http://www.nist.gov/fire/upload/NS_multi.wmv.

²⁶³ *NFPA 921* (2014 ed.), *supra* note 150, ch. 5.

²⁶⁴ *NFPA 921* (2014 ed.), *supra* note 150, ch. 6.

²⁶⁵ *NFPA 921* (2014 ed.), *supra* note 150, ch. 18.

²⁶⁶ *NFPA 921* (2014 ed.), *supra* note 150, ch. 19.

*cautioned that these concepts are presented at an elementary level and additional technical sources, training, and education may often need to be utilized in an investigation.*²⁶⁷
[Emphasis added.]

Therefore, taking into account the subjective nature of fire pattern interpretation and the variables involved, together with the cautionary statements in the *NRC/NAS Report* respecting frailties of scientific disciplines relying on subjective interpretation, how accurate is the process of interpreting fire patterns? The short answer is that no one knows.

By way of illustration, one of the authors has attended seminars where the organizers set fires in a compartment such as a room, and then later the seminar participants investigate the scene to determine the area of origin or the cause. The accuracy of participants in correctly identifying the cause of the fire was extremely poor. We are not aware of any formal publications that maintain statistics and report the results of such tests, but anecdotal evidence suggests the accuracy rate is abysmal. An example of this is provided by former Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) Senior Special Agent Steve Carman in his paper, *Improving the Understanding of Post-Flashover Fire Behavior*.

Fire investigators are regularly called upon to interpret burn patterns and to determine where fires originate. Patterns created by pre-flashover fires are often easily deciphered by investigators seeking the fire origins. The severe burn damage found in fully involved fires can be far more daunting to interpret, making origin determination extremely difficult.

At a 2005 fire training conference, fire investigators from the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) designed and presented a seminar on Fire Dynamics. Two, identical, one-room burn cells with standard-sized doorways were each burned for 7 minutes. Hours later, fifty-three fire investigator-students (who had not observed the fires) were asked to briefly examine the cells and decide in which quadrant of each cell they thought the fires had started. 5.7% of the students correctly identified the quadrant of origin in each cell. A review was undertaken of investigators' responses in similar, postflashover exercises at the Federal Law Enforcement Training Center in Georgia. Though written records of those responses are not kept, anecdotal reports by long-time instructors indicate that since the class' inception in the early-1990s, about 8-10% of students correctly identified the fire's origin. Those who incorrectly identified the area of origin typically said they were misled in their analyses by extensive burn patterns.²⁶⁸

Even though there are no published error rates for fire investigations, the Carman paper raises a red flag about the problems with fire pattern interpretation as a function of subjectivity together with the investigator's level of training and experience. To his credit, Special Agent Carman published this information, which was a closely held secret until then. He also went about

²⁶⁷ NFPA 921 (2014 ed.), *supra* note 150, § 1.3.5.

²⁶⁸ Steven W. Carman, *Improving the Understanding of Post-Flashover Fire Behavior*, in NAT'L ASS'N OF FIRE INVESTIGATORS, PROCEEDINGS OF THE 3RD INTERNATIONAL SYMPOSIUM ON FIRE INVESTIGATION SCIENCE AND TECHNOLOGY 221, 221 (2008).

identifying some of the reasons for this poor success rate²⁶⁹ and created a training program to help improve their skills at fire pattern interpretation.²⁷⁰

It can be said that the Carman paper has limited value for two reasons. First because it deals with post-flashover scenarios, it does not pertain to the instances in which fire investigators are analyzing the area of origin in fires that do not involve flashover.²⁷¹ Further, it is arguable that, “the high error rate mentioned in the Carman Report is statistically meaningless because the investigators in that study were by design not permitted to conduct full cause and origin investigations in making their determinations, naturally resulting in determinations that were far more likely to be in error.”²⁷²

Regardless of whether the impact of the insights from the Carman paper can be minimized or explained away, the fact is that no method of proficiency testing has been developed to test the competency of investigators or measure the accuracy of investigators who interpret fire patterns. Unfortunately, there are few ways to verify objectively whether an investigator’s determination of the area of origin or cause of a fire is correct. To quote one’s trial record and say that a judge or jury agreed with an investigator’s analysis in rendering a verdict is hardly proof of accuracy. Proficiency testing of fire pattern interpretation at fire scenes, particularly those with extensive burning or flashover, may not even be a realistic possibility. The possibilities of subjectivity, bias, or human error are therefore very serious concerns in terms of the reliability of fire investigations.

²⁶⁹ These reasons relate to the difficulty investigators experienced in trying to interpret burn patterns created after the burn cell (*i.e.* room) had undergone flashover, which is, in colloquial terms, the point when the temperatures are so hot that the entire room is engulfed in fire. For more information about flashover, see the definitions and video link, *supra* note 262.

²⁷⁰ The abstract of Special Agent Carman’s paper explains, in part, his plan for improving fire investigators’ abilities to interpret burn patterns:

This paper offers a new and proven approach for enhancing investigators’ understanding of post-flashover fire behavior through use of standard fire dynamics instruction combined with the graphic output of the computer programs, Fire Dynamics Simulator and Smokeview. Such training offers students a visual introduction to the nuances of ventilation-limited burning. It also introduces the use of computer models in hypothesis-testing as part of an investigative methodology. Carman, *supra* note 268, at 221.

²⁷¹ Government’s Opposition to Defendant’s § 2255 Motion and Motion for New Trial, ¶ 1, *United States v. Hebshie*, 754 F. Supp. 2d 89 (D. Mass. 2010) (“The Carman Report is irrelevant because it deals only with concerns that arise during the investigation of “post-flashover” fire scenes, and the fire in this case did not involve a flashover.”).

²⁷² *Id.* (“In conducting his study, Mr. Carman purposely did not allow fire scene investigators to conduct full cause and origin investigations. In particular, he did not allow them to perform two fundamental tasks underlying any adequate investigation: he did not permit them to interview witnesses at the scene (as there were none), or to inspect the scene for signs of electrical causes of the fire, forcing them instead to narrowly focus on just the burn patterns.”).

The *NRC/NAS Report* mentioned problems of bias in opinions in two fields that rely heavily on the level of the expert's experience. These two fields are forensic odontology²⁷³ (the expert field of dentistry that involves bite mark identification, identifying bodies through dental records, and the like), and impression evidence (tire tread marks and footprints). With respect to these experience-based disciplines, the *NRC/NAS Report* concluded, "it is difficult to avoid biases in experience-based judgments, especially in the absence of a feedback mechanism to correct an erroneous judgment."²⁷⁴ One could say the same of interpreting fire effects and patterns in fire investigation.

Though it is not possible to establish error rates for the type of subjective analysis or human interpretation that is required in most aspects of fire investigations, it is certainly important in light of the *NRC/NAS Report's* comments on subjective, experience-based forensics, to consider possible sources of bias that would influence or impair an expert's judgment. The authors warn that, "forensic scientists must carefully guard against cognitive bias and natural, but scientifically inappropriate, overconfidence in their scientific opinions."²⁷⁵ This is equally true of fire experts.

There are different types of biases. The bias addressed by the *NRC/NAS Report* relates to cognitive bias, introduced by the *NRC/NAS Report* as follows:

Human judgment is subject to many different types of bias, because we unconsciously pick up cues from our environment and factor them in an unstated way into our mental analyses. Those mental analyses might also be affected by unwarranted assumptions and a degree of overconfidence that we do not even recognize in ourselves. Such cognitive biases are not the result of character flaws; instead, they are common features of decisionmaking, and they cannot be willed away. (citing by way of example, M.J. Saks, D.M. Risinger, R. Rosenthal, and W.C. Thompson. 2003. Context effects in forensic science: A review and application of the science of science to crime laboratory practice in the United States. *Science and Justice* 43(2):77-90.)²⁷⁶

One type of cognitive bias is known as "observer effects," described as, "external information provided to persons conducting analyses [that] may taint their conclusions—a serious problem in techniques with a subjective component."²⁷⁷ In the same vein is "contextual bias" where the subjective judgment of a person conducting an analysis is influenced by the context in which the

²⁷³ NRC/NAS REPORT, *supra* note 53, at 174.

²⁷⁴ *Id.* at 149.

²⁷⁵ *Ex Parte Robbins*, 360 S.W.3d 446, 476 n.16 (Tex.Crim.App., 2011) *reh'g denied* (Sept. 21, 2011), *cert. denied*, 132 S. Ct. 2374 (U.S. 2012) (3–4 decision) (*per* Cochran, J., dissenting, joined by Womack & Johnson, JJ.) (citing the NRC/NAS REPORT, *supra* note 53, at 122–124).

²⁷⁶ NRC/NAS REPORT, *supra* note 53, at 122.

²⁷⁷ Paul C. Giannelli, Edward J. Imwinkelried & Joseph L. Peterson, *Reference Guide on Forensic Identification Expertise*, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 67 (Federal Judicial Ctr. ed., 2011) (citing D. Michael Risinger *et al.*, *The Daubert/Kumho Implications of Observer Effects in Forensic Science: Hidden Problems of Expectation and Suggestion*, 90 CAL. L. REV. 1 (2002)).

analysis is made. The context of the analysis might include information concerning the alleged crime, which is unnecessary to the analysis but might improperly influence the analyst's judgment. Examples of such information are the opinion of another investigator or the alleged confession of a suspect.²⁷⁸

Other publications provide insights respecting other types of bias that can influence an expert's opinion, one of which is adversarial bias, exhibited by the proverbial "hired guns," who adjust their opinions to the needs of the party who hired them.²⁷⁹ Another type of bias arises from an expert's conflict of interest²⁸⁰—an incompatibility between an expert's private interests and his duty to render his or her opinion truthfully and objectively. Bias arising from conflicts of interest has historically been an issue of the credibility and weight of expert testimony rather than the admissibility of testimony.²⁸¹ As such, it has long been in the province of the finder of fact, usually the jury and is a choice tool for cross-examining experts. However, whether it is in the purview of a trial judge ruling on a *Daubert* motion to exclude an expert's testimony based on bias arising from a conflict of interest is still an issue.²⁸²

Nor is clear the extent to which courts might consider evidence of cognitive biases when evaluating an admissibility challenge under *Daubert* or its progeny. The introductory section of the 2011 edition of the *Reference Manual on Scientific Evidence*, a popular publication of the Federal Judicial Center, comments briefly about the issue of scientific evidence that is subject to interpretation:

Forensic techniques that rest on subjective judgments are susceptible to cognitive biases. (*NAS Report*, at 184–185.) We have seen instances of contextual bias, but as yet there has been little research on contextual or other types of cognitive bias. We do not yet know whether courts will consider this type of evidence when expertise is challenged.²⁸³

Daubert does not explicitly list bias as a reliability factor, but according to *Daubert*, a court is free to use other factors that are relevant in a reliability inquiry. Perhaps it is time to implement cognitive bias and subjectivity as factors used to measure not only the weight, but the admissibility of expert testimony under *Daubert* and its offshoots. This approach is a possibility. One judge in New Hampshire in deciding a *Daubert* motion used the issue of bias as relevant in a *Daubert* inquiry,

²⁷⁸ See e.g., NRC/NAS REPORT, *supra* note 53, at 24, 79, 123.

²⁷⁹ David E. Berstein, *Expert Witnesses, Adversarial Bias, and the (Partial) Failure of the Daubert Revolution*, 93 IOWA L. REV. 451 (2008).

²⁸⁰ *Conflict of interest Definition*, BLACK'S LAW DICTIONARY (9th ed. 2009), available at Westlaw BLACKS ("1. A real or seeming incompatibility between one's private interests and one's public or fiduciary duties.").

²⁸¹ Margaret A. Berger, *The Admissibility of Expert Testimony*, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 21 (Federal Judicial Ctr. ed., 2011).

²⁸² *Id.* at 22.

²⁸³ *Id.* at 29.

viewing the expert's testimony in light of the statements in *NFPA 921* about expectation bias and ruling that the expert's testimony on the fire origin and cause was not admissible.²⁸⁴

NFPA 921 does deal with two types of cognitive bias, but in a very cursory fashion. Expectation bias and confirmation bias are the subject of a few limited cautionary statements.²⁸⁵ Expectation bias occurs when an investigator reaches "a premature conclusion without having examined or considered all of the relevant data"²⁸⁶ and then consciously or unconsciously, skews the remaining steps in the investigation to support the original, premature, conclusion. Confirmation bias occurs when an investigator tries to prove, rather than disprove, his or her hypothesis, which can prevent the investigator from rigorously testing that hypothesis or considering alternative hypotheses.²⁸⁷

Until methods are developed to deal with the problems of subjectivity and bias in fire investigations, it is incumbent on courts, attorneys, and experts in civil and criminal fire cases to use the tools available through the justice system to guard against their impact on the reliability of an expert's conclusions. A vigorous application of *Daubert* is one of the most important, and perhaps most underutilized of these tools.

9. CONCLUSION

The premise of this article has been to describe the confluence of forces forming a perfect storm for fire investigators. It all started with the war against junk science that gave us *Daubert* and its tests to measure the reliability of expert testimony that address the admissibility, not just the weight of evidence. *Daubert* arrived on the scene at about the same time as did the first edition of *NFPA 921*. That was more than twenty years ago. For a while, *Daubert* used in conjunction with *NFPA 921* gave fire experts a tough time, but they adapted.

Challenges have continued to evolve for scientific evidence and for fire investigations. The innocence projects got involved in arson, measuring past convictions by today's knowledge base and casting shadows over expert testimony. In the meantime, *NFPA 1033*, innocuous at the outset, began growing teeth. As a mandatory standard, it always had potential for use in court. However, it was largely ignored by the courts because it did not have sufficiently specific requirements to effectively challenge the qualifications of investigators. Then in 2009, it took a bold step forward,

²⁸⁴ *State v. McLeod*, No. 213-2010-CR-00585-00588 (Cheshire Cty Super. Ct. 2011) (slip op.) (New Hampshire) (excluding the evidence of an expert witness who testified that his practice is to start every fire investigation with the presumption that the fire is accidental, finding that this approach constitutes expectation bias that runs afoul of *NFPA 921* § 4.3.7 'Avoid Presumption.'") (citing *NFPA 921*, *supra* note 150, §§ 4.3.7–4.3.9).

²⁸⁵ *NFPA 921* (2014 ed.), *supra* note 150, § 4.1 (cautioning that data should be gathered "without expectation bias, preconception, or prejudice"), *Id.* § 4.3.8 (introducing expectation bias), *Id.* § 4.3.9* (introducing confirmation bias), *Id.* § 4.6.2.1. (listing confirmation bias as one limitation of technical reviews), *Id.* § 12.4.2.3.2. (making a brief mention of bias in the context of witness bias in discovery proceedings).

²⁸⁶ *NFPA 921* (2014 ed.), *supra* note 150, § 4.3.8.

²⁸⁷ *NFPA 921* (2014 ed.), *supra* note 150, § 4.3.9.

upping the minimum knowledge requirements for fire investigators with the “list of 13.” By the year 2014 that list has grown to 16—not just a list of “things” for investigators to define, but entire fields to be studied and mastered. And in the same year, *NFPA 921* has expanded even further and developed closer ties with *NFPA 1033*, making both documents potentially more potent in evaluating the qualifications of investigators and the reliability of their courtroom testimony.

Meanwhile, forensic sciences, including fire investigations, have come under scrutiny with the *NRC/NAS Report*. The *NRC/NAS Report* is an authoritative document and its proclamations have not gone unnoticed. The most recent development arising from the *NRC/NAS Report* is collaboration between the USDOJ and NIST establishing a National Commission on Forensic Science “as part of a new initiative to strengthen and enhance the practice of forensic science.”²⁸⁸ While it is too early to predict the impact of the new Commission on fire investigations policy and best practices, this step by the federal government indicates that the *NRC/NAS Report* is not going away any time soon.

The consequence is a rejuvenation of *Daubert* and more pressure on the legal and scientific communities to ensure the reliability of scientific evidence, fire investigations included. Further, the *NRC/NAS Report* points to subjectivity and bias as soft spots in forensic science, and fire investigators are vulnerable by these measures. The answers given by the *NRC/NAS Report* and other authorities that have considered these problems such as the TFSC,²⁸⁹ put an increasing focus on certification and the necessity to abide by industry standards. This puts *NFPA 921* and *NFPA 1033* in the limelight.

Taking all of these forces together, we predict that experts, attorneys, and judges will learn to make more sophisticated use of *NFPA 1033* and *NFPA 921* in court. Even where a court does not make a ruling that *NFPA 921* or *NFPA 1033* are mandatory requirements, the level of advocacy respecting the admissibility of expert evidence in fire cases is on the upswing, which is bound to feel like a storm for many fire experts.²⁹⁰ We can only hope that the passing of this perfect storm will take with it some of the frailties of fire investigations highlighted here and leave behind in its wake, a more accurate and reliable discipline.

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Terry-Dawn Hewitt has focused her career on fire law. She is an attorney-at-law in the US and a barrister and solicitor in Canada. She has held leadership positions on committees for the National

²⁸⁸ Press Release, Department of Justice and National Institute of Science and Technology Announce Launch of New Commission on Forensic Science (Feb. 15, 2013) available at <http://www.nist.gov/oles/doj-nist-forensic-science021513.cfm>.

²⁸⁹ See TFSC Final Report, *supra* note 193, and the TFSC Addendum Report, *supra* note 193. See Part I of this article for further detail.

²⁹⁰ *Schlesinger v. United States*, 09-CV-4278 ADS, 2012 WL 407098 (E.D.N.Y. Feb. 6, 2012) (distinguishing *United States v. Hebshie*, 754 F.Supp.2d 89 (D. Mass. 2010), but going into significant detail in the evaluation of the negative corpus evidence).

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