

COMMONWEALTH OF KENTUCKY
LOGAN CIRCUIT COURT
CASE NO. 04-CR-00232

ROBERT YELL

MOVANT

v.

COMMONWEALTH OF KENTUCKY

RESPONDENT

**BRIEF OF AMICUS CURIAE THE INNOCENCE NETWORK IN SUPPORT OF
ROBERT YELL'S MOTION TO VACATE JUDGMENT AND CONVICTION
PURSUANT TO CR 60.02(f)**

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I hereby certify that on _____, 2016, a true and accurate copy of the foregoing was served by first-class U.S. Mail, postage prepaid, to Hon. Gail Guiling, 210 Bethel Street, P.O. Box 1133, Russellville, Kentucky 42276; Hon. Tyler L. Gill, Chief Circuit Judge, P.O. Box 667, 200 W. Fourth St., Russellville, Kentucky 42276; counsel for movant Krista A. Dolan, Esq., 207 Parker Drive, Ste. 1, LaGrange, Kentucky 40031; and Mr. Robert Yell, #198788, Kentucky State Penitentiary, 266 Water Street, Eddyville, Kentucky 42038.

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STATEMENT OF AMICUS INTEREST

The Innocence Network (the “Network”) is an association of organizations dedicated to providing pro bono legal counsel to indigent prisoners whose actual innocence may be established in post-conviction proceedings. Its members operate in every state and the District of Columbia, and have helped exonerate hundreds individuals nationwide.¹ Through this work, the Network has gained extensive knowledge of the key factors that contribute to wrongful convictions, one of which directly led to Robert Yell’s conviction for arson: faulty science and opinion testimony based thereon.

Mr. Yell is not alone. Based on its experience exonerating innocent individuals and examining the causes of wrongful convictions, the Network has become keenly aware of the role that unreliable or improper scientific evidence has played in producing miscarriages of justice, particularly in matters, such as the instant case, where the prosecution is dependent on expert

¹ The Innocence Network’s member organizations include the Actual Innocence Clinic at Univ. of Texas School of Law, After Innocence, Alaska Innocence Project, Arizona Justice Project, California Innocence Project, Center on Wrongful Convictions, Committee for Public Counsel Services Innocence Program (MA), Connecticut Innocence Project, Duke Center for Criminal Justice and Professional Responsibility, Georgia Innocence Project, Hawai’i Innocence Project, Idaho Innocence Project (Idaho, Montana, Eastern Washington), Illinois Innocence Project, Innocence & Justice Project at the Univ. of New Mexico, Innocence Network UK, The Innocence Project, Innocence Project at UVA School of Law, Innocence Project London, Innocence Project Minnesota, Innocence Project New Orleans (Louisiana), Innocence Project Mississippi, Innocence Project New Zealand, Innocence Project Northwest Clinic (Washington), Innocence Project of Florida, Innocence Project of Iowa, Innocence Project of Texas, Kentucky Innocence Project, Knoops’ Innocence Project, Michigan Innocence Clinic, Mid-Atlantic Innocence Project (Washington, D.C., Maryland, Virginia), Midwestern Innocence Project (Missouri, Kansas, Iowa), Montana Innocence Project, Nebraska Innocence Project, New England Innocence Project (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont), New York Law School Post-Conviction Innocence Clinic, North Carolina Center on Actual Innocence, Northern California Innocence Project, Office of the Public Defender, State of Delaware, Ohio Innocence Project, Oklahoma Innocence Project, Oregon Innocence Project, Reinvestigation Project, Resurrection After Exoneration, Pennsylvania Innocence Project, Rocky Mountain Innocence Project, The Sellenger Centre (Australia), Wake Forest University Law School Innocence and Justice Clinic, West Virginia Innocence Project, the Wesleyan Innocence Project, and the Wisconsin Innocence Project.

opinions. The “science” underlying such convictions has been exposed as flawed, disputed, or outright false. Examination of postconviction-DNA-based exonerations has demonstrated that flawed or inaccurate forensic science testimony has contributed to approximately 50% of those wrongful convictions. Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 VA. L. REV. 1, 14 (2009); see also R. Paul Bieber, *Anatomy of a Wrongful Arson Conviction* (The Arson Research Project, 2014), http://the arsonproject.org/charm/wp-content/uploads/2014/08/wrongful_convictions.pdf. Experience in these cases shows that proof of innocence is often untidy, untimely, and defies bright-line procedural strictures. See Brandon L. Garrett, *Judging Innocence*, 108 COLUM. L. REV. 55, 106 (2008) (noting that 86% of the individuals exonerated by DNA evidence had previously had their claims denied by appellate courts). Therefore, especially in science-dependent cases such as the present one, the Network is committed to ensuring, as an essential component of a fair and just determination of the facts, that the scientific underpinnings of scientific testimony are fully examined. Here, the case against Mr. Yell relied upon the specific area of unreliable expert testimony regarding outdated theories of forensic fire science.

STATEMENT OF FACTS

The Network adopts by reference the statement of facts set forth in Mr. Yell’s Motion to Vacate Judgment and Conviction Pursuant to CR 60.02(f), filed on May 2, 2016.

BACKGROUND – FIRE SCIENCE IN AMERICAN COURTS

Mr. Yell’s conviction occurred in the context of a previously unrecognized but now unquestionable disconnect between scientific reality and the investigative methods and assumptions applied by the prosecution’s expert witnesses. As described below and as documented in R. Paul Bieber’s Declaration attached to Mr. Yell’s Motion, recent advances in the science underlying fire investigations have exposed the unreliability of the assumptions the

Commonwealth's investigators applied as the basis for the expert opinions presented to the jury in Mr. Yell's case.²

I. THE EVOLUTION OF FIRE SCIENCE

Only in the past twenty-five years has fire science applied scientific methods to test and validate prior experience-based beliefs (“rules of thumb”), and develop scientifically supported standards for investigation and analysis.³ This progress has not occurred uniformly in all fire departments at the same time, and some fire investigators maintained prior beliefs and assumptions, such as application of pre-flashover burn pattern analysis to post-flashover fires,⁴ or that an “accelerant detection canine” (“ADC”) could accurately alert to and discern the presence

² Numerous peer-reviewed publications demonstrate the shift in scientific understanding of fire investigations. *See, e.g.*, Nat'l Fire Protection Ass'n, *NFPA 921: Guide for Fire & Explosion Investigations* (2014) (hereinafter “NFPA 921”); Edward I. Imwinkelreid & Paul C. Gianneli, *SCIENTIFIC EVIDENCE*, Vol. 2, § 26.04 (Matthew Bender, 4th ed. 2015); Marc P. Wolf, *Habeas Relief From Bad Science: Does Federal Habeas Corpus Provide Relief for Prisoners Possibly Convicted on Misunderstood Fire Science?*, 10(1) MINN. J. L. SCI. & TECH. 213 (2009); Rachel Dioso-Villa, *Scientific and Legal Developments in Fire and Arson Investigation Expertise in Texas v. Willingham*, 14(2) MINN. J. L. SCI. & TECH. 817 (2013).

³ Professors Imwinkelreid and Gianneli note that in the past quarter century, i.e. the post-*Daubert* era, there has been tremendous progress in fire science, particularly due to headline-grabbing cases such as that of Cameron Todd Willingham in Texas. As a result, “courts are taking a more skeptical attitude toward many of the generalizations traditionally relied on by fire investigators . . . [and] experts are turning to more rigorous, scientific methods of analysis.” *SCIENTIFIC EVIDENCE*, Vol. 2, § 26.01; *see also* Steven W. Carman, *Science Trumps Art in Fire Investigation*, 74(7) TEXAS BAR JOURNAL 587 (July 2011) (discussing the historical development of forensic fire investigation techniques and standards). The Department of Justice observed in 1977 that no scientific evidence supported the widely accepted “rules of thumb” that fire investigators used as “indicators” of arson. Richard L.P. Custer, *Considerations for Arson Investigations in NFPA 921 – Guide for Fire and Explosion Investigations*, in *PROC. OF THE INT’L SYMP. ON THE FORENSIC ASPECTS OF ARSON INVESTIGATIONS*, 31, 32-33 (1995).

⁴ Flashover is “[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 § 3.3.83; *see also* Declaration of R. Paul Bieber (“Bieber Decl.”) ¶ 24.

of ignitable fluids as opposed to other similar chemical compounds without laboratory confirmation, or that ignitable liquids left burn patterns that resembled “pour marks” or puddles. Those very beliefs, which the Commonwealth used to convict Mr. Yell, have now roundly been proven false and unreliable when applied to a post-flashover fire, as occurred in Mr. Yell’s mobile home.

The experiential-based, unscientific nature of fire “science” began to change when the National Fire Protection Association’s⁵ Technical Committee on Fire Investigations codified its guidelines in 1992 as NFPA 921, which provided guidance to investigators based on scientific principles. NFPA 921 explained, among other issues, that the widespread beliefs regarding the infallibility of burn indicators as evidence of arson were wrong. *See* NFPA 921.

In 2000, the U.S. Department of Justice formally endorsed NFPA 921, and the standards established therein, as the “standard of care” for fire investigations. *See, e.g.*, National Institute of Justice, U.S. Dep’t of Justice, *Fire and Arson Scene Evidence: A Guide for Public Safety Personnel* at 6 (2000), <https://www.ncjrs.gov/pdffiles1/nij/181584.pdf> (“[NFPA 921 is] a benchmark for the training and expertise of everyone who purports to be an expert in the origin and cause determination of fires.”).⁶ However, the fire investigation community as a whole was slow to adopt the new guidelines, despite endorsement by government agencies. Wolf, *Habeas Relief*, *supra* at 218-19; Carman, *Science Trumps Art*, *supra* at 387.

⁵ The National Fire Protection Association (NFPA) is a global nonprofit organization, established in 1896, devoted to eliminating death, injury, property and economic loss due to fire, electrical and related hazards. NFPA, *About NFPA*, <http://www.nfpa.org/about-nfpa> (last accessed June 6, 2016).

⁶ The reliability of NFPA’s recommendations and guidelines has been widely recognized. For example, the Kentucky Legislature expressly adopted the published standards of the NFPA for the “design, installation and construction of containers and pertinent equipment for the storage and handling of liquefied petroleum gases” KRS § 234.150.

Application of the scientific methodology embraced in NFPA 921 only percolated through fire departments and jurisdictions, without contemporaneous universal adoption. *See* Caitlin M. Plummer & Imran J. Syed, ‘*Shifted Science*’ Revisited: *Percolation Delays and the Persistence of Wrongful Convictions Based on Outdated Science*, 64 CLEV. ST. L. REV. ____ (Forthcoming 2016) (citing John J. Lentini, SCIENTIFIC PROTOCOLS IN FIRE INVESTIGATION, 13 (2d ed. 2013)). The NFPA 921 is generally accepted as the standard in the fire investigation community. *See, e.g., Bunch v. Indiana*, 964 N.E.2d 274, 288 (Ind. Ct. App. 2012).⁷ As described in section II and III below, only now has the fire science community recognized (a) that burn pattern analysis is not reliable for post-flashover fires, and (b) that ADC alerts require laboratory confirmation to be held reliable.

In 2009, the National Research Council (“NRC”), in connection with the National Academy of Sciences (“NAS”), published a report revealing significant deficiencies in multiple forensic disciplines, including fire investigation. Nat’l Research Council of the Nat’l Academies, *Strengthening Forensic Science in the United States: A Path Forward* (2009) (“NAS Report”). In its assessment of the state of fire investigation, the NAS Report stated, “[M]any of the rules

⁷ In fact, one court has found that counsel is ineffective if she does not object to expert testimony that does not comply with NFPA 921. *See United States v. Hebshie*, 754 F.Supp. 2d 89, 92 (D. Mass. 2010). Moreover, in the context of civil insurance cases involving arson, NFPA is the recognized authority for fire investigation standards. *See, e.g., United Fire & Cas. Co v. Whirlpool Corp.*, 704 F.3d 1338, 1341 (11th Cir. 2013) (finding that the trial court abused its discretion when it excluded expert’s testimony based on application of NFPA 921 methodology to physical evidence); *Travelers Cas. Ins. Co. of Am. v. Volunteers of America*, 2012 U.S. Dist. LEXIS 117789 (E.D. Ky. Aug. 21, 2012) (“[F]ollowing NFPA 921 indicates the reliability of an investigator’s methods, [though] a departure from the document’s guidelines is not necessarily in and of itself grounds for automatic disqualification.”); *Thompson v. State Farm Fire & Cas. Co.*, 548 F. Supp. 2d 588, 592 (W.D. Tenn. 2008) (“Courts have recognized NFPA 921 as a ‘guide for assessing the reliability of expert testimony in fire investigations.’”); *Travelers Indem. Co. v. Ind. Paper & Packaging Corp.*, No. 3:02-cv-491, 2006 U.S. Dist. LEXIS 43851, at *12 (E.D. Tenn. June 27, 2006) (“The Court recognizes that NFPA 921 is a peer reviewed and generally accepted standard in the fire investigation community.”)

of thumb that are typically assumed to indicate that an accelerant was used . . . have been shown not to be true.” *Id.* at 5-34-35 (emphasis added). The 2009 NAS Report constitutes the most definitive declaration from a scientific community recognizing the unreliability of outdated assumptions and methodology employed by prior arson investigations. Multiple federal courts have now granted *habeas* petitions, finding defendants actually innocent of arson for which they were convicted on the basis of such unreliable and faulty fire “science” evidence. *See Han Tak Lee v. Houtzdale SCI*, 798 F.3d 159, 166-69 (3d Cir. 2015); *Souliotes v. Hedgpeth*, No. 1:06-cv-00667, 2012 WL 1458087 at *18-22 (E.D. Cal. Apr. 26, 2012), *adopted at* 2012 WL 2684972 (E.D. Cal. Jul. 6, 2012); *United States v. Hebshie*, 754 F. Supp. 2d 89, 92 (D. Mass. 2010).

As discussed in Mr. Beiber’s declaration (Bieber Decl. ¶¶ 32-46, 80-91) and in publications of other widely accepted experts in the field,⁸ scientific studies have conclusively proven that the fundamental assumptions upon which the Commonwealth’s fire investigators relied are, in fact, unreliable. First, court admission of unconfirmed accelerant-detection canine alerts (ADCs) is now widely condemned by every major fire science association, including, now the Canine Accelerant Detection Association (CADA), the largest organization of professional ADC handlers. *See, e.g., United States v. Hebshie*, 754 F. Supp. 2d 89, 92 (D. Mass. 2010); *see also* John J. Lentini, *Evolution of Investigation and Its Impact on Arson Cases*, 27 CRIMINAL JUSTICE 1, 3 (Spring 2012); Bieber Decl. ¶¶ 80-91. Second, the reliance on burn indicators for determining whether a fire had a single or multiple sites of origin, or for determining whether an accelerant was used, has been discredited, in part, based on the fire science community’s better understanding of the phenomenon of “flashover” and studies demonstrating that flashover severely undermines the reliability of burn pattern analysis. *See* Lentini, *Evolution of*

⁸ *See, e.g.,* Lentini, *Evolution of Investigation, infra*, at 4-6.

Investigation, supra, at 4-5; *see also* Bieber Decl. ¶¶ 32-46.

The use of unconfirmed ADCs and burn pattern analysis without accounting for flashover are just two of many aspects of outmoded fire “science” that have been entirely debunked.⁹ With the advancement of knowledge regarding fire and fire science, a leading legal treatise concluded:

A quarter century ago, if the investigator encountered “indicators” of arson, he or she could be relatively confident in assuming that a flammable liquid had been poured in the area; the furniture, carpet, and other wall coverings normally present in a house could not have accounted for the indicators. Today, however, the investigator can no longer make that assumption. We now know that many of these indicators are “deficient for want of any established scientific validity.” Indeed, the National Fire Academy has added a module entitled “Myths and Legends” to its course on Fire/Arson Origin and Cause Investigation.

...

Other research has confirmed that post-flashover room fires can sustain temperatures of over 2,000 degrees F, no matter how they are ignited. In light of the new research, the courts must take a more skeptical attitude toward the traditional generalizations on such topics as char, pour patterns, and spalling. Quite frankly, some of the old bromides once popular among fire investigators have been exposed as myths. In particular, the growing scientific understanding of the phenomenon of flashover—‘the transition from a fire in a room to a room on fire’—has undermined many of those bromides.

Imwinkelreid & Gianneli, *SCIENTIFIC EVIDENCE*, Vol. 2, § 26.04 (Matthew Bender, 4th ed. 2015).

⁹ Further aspects of fire science also have been recently determined to be unreliable, including the common beliefs “that the lowest area of burn in a room was proof of origin . . . [, that t]he area of deepest char may indicate the origin of the fire . . . [,] that the smallest squares [“alligatored” wood] were ordinarily present at the point of origin . . . [,] that the presence of very small cracks in the glass was indicative of very intense heat or a rapid buildup of heat . . . [and that t]he occurrence of spalling can indicate the presence of . . . a source of localized heating such as a chemical incendiary.” Imwinkelreid & Gianneli, *SCIENTIFIC EVIDENCE*, Vol.2 § 26.04.

II. COURTS ACROSS THE UNITED STATES HAVE RECOGNIZED THAT THE UNRELIABILITY OF PAST FIRE SCIENCE EXPERT OPINIONS UNDERMINES PRIOR CONVICTIONS AND PRECLUDES THEIR ADMISSION IN CONTEMPORANEOUS TRIALS.

In the wake of the evolution of fire science, courts across jurisdictions have recognized that advances in fire science undermine prior convictions, requiring the reversal of convictions and new trials. *See Han Tak Lee*, 798 F.3d at 166-69 (affirming grant of *habeas* relief for a 1990 homicide conviction resting on now discredited fire investigation evidence); *Souliotes*, 2012 WL 1458087 at *18-22 (finding that actual innocence had been established because, in part, the fire investigation evidence introduced by the prosecutions had been discredited);¹⁰ *People v. Chase*, No. I-040-95, 2005 N.Y. slip op. 51125(U) (N.Y. Co. Ct. May 19, 2005); *see also Hebshie*, 754 F. Supp. 2d at 92 (reversing arson conviction based on patent unreliability of an accelerant detection canine); *Carr v. State*, 482 S.E.2d 314, 316-17 (Ga. 1997) (reversing conviction based on ADC alert evidence). Moreover, three state legislatures have passed resolutions explicitly stating that convictions based on methods inconsistent with NFPA 921 require post-conviction judicial review. Okla. S. Res. 99, 52nd Leg., 2d Sess. (Okla. 2010); Ariz. H. Con. Res. 2066, 49th Leg., 2d Reg. Sess. (Ariz. 2010); Neb. Legis. Res. 411, 101st Leg., 2d Sess. (Neb. 2010).

¹⁰ In both *Han Tak Lee* and *Souliotes*, the prosecution conceded that the fire investigation evidence that was originally used to convict had been discredited and was unreliable. *See Han Tak Lee*, 798 F.3d at 161, 167 (noting that where the prosecution’s experts originally opined that a fire was intentionally set based on (a) deep charring and crazed glass purportedly evidencing a fire started with accelerants and (b) burn patterns purportedly evidencing multiple sites of origination, “[t]he Commonwealth [later] concede[d] that, due to scientific developments since Lee’s trial in 1990, the basis for all of this evidence is now invalid”); *Souliotes*, 2012 WL 1458087 at *18-22 (noting that the prosecution recanted its prior expert testimony that the fire was arson because of the unusually high heat purportedly evidenced by “pour patterns” burnt on the floor, deep charring of walls, a light amount of combustible material within the motor home, and results from a hand-held hydrocarbon detector used at the scene of the fire, and instead, stipulated that it was not possible to determine the cause of the fire). The experts in these cases relied on burn patterns that were essentially meaningless because the experts had failed to account for flashover, the same mistake made by the Commonwealth’s experts in the prosecution of Mr. Yell.

Due to the recent acceptance of advancements in fire science, courts considering arson cases will now exclude expert opinions inconsistent with NFPA 921 methods and guidelines as unreliable at trial. *See, e.g., Travelers Cas. Ins. Co. of Am. ex rel. Palumbo v. Volunteers of Am. Ky., Inc.*, No. 5:10-301-KKC, 2012 WL 3610250, at *2 (E.D. Ky. Aug. 21, 2012) (explaining that NFPA 921 requires deviations from its procedures to be justified and requires that the scientific method be used in every case); *Barr v. Farm Bureau Gen. Ins. Co.*, 806 N.W.2d 531, 460 (Mich. Ct. App. 2011) (similar); *Werth v. Hill-Rom, Inc.*, 856 F. Supp. 2d 1051, 1060, 1063 (D. Minn. 2012) (holding expert testimony inadmissible for failure to apply NFPA 921 methodology); *United States v. Myers*, No. 3:10-00039, 2010 WL 2723196, at *4 (S.D.W.Va. July 8, 2010) (excluding evidence of a dog's alerts unconfirmed by laboratory tests, as required by NFPA standards).

Just as the opinions of experts in the cases discussed above were discredited and proved to be unreliable, and therefore inadmissible, the opinions of the Commonwealth's experts Al Gregory, Samuel Flowers, David West, and Buster Cannon are fatally flawed and unreliable. If these opinions were proffered today, they would be inadmissible given the advancements in fire science now recognized by courts throughout the country.

SUMMARY OF ARGUMENT

The advancement of science has demonstrated conclusively that the evidence on which Robert Yell was convicted of arson was, at best, unreliable, and there is now general consensus among the greater fire science community that such evidence is scientifically unsupportable.

Specifically, the use of ADC alerts for the presence of ignitable liquid without laboratory confirmation is now rejected by all major fire investigation associations in the United States. Moreover, since Yell's conviction, courts have recognized that such ADC alert evidence is unreliable, and that the collateral evidence of the dog handler's subjective beliefs about the dog's

conduct is both unreliable and unfairly prejudicial.

Also, the “myths” or “rules of thumb” used in this case to analyze burn patterns have now been discredited. Among other factors, the phenomenon of “flashover” undermines the reliability of such prior assumptions regarding fire originations and the presence of ignitable liquid based on burn patterns.

Because the Commonwealth’s fire “experts” relied entirely on (a) unreliable ADC alert evidence without corroborating laboratory test results, and (b) outdated burn pattern analysis and assumptions that failed to account for “flashover,” due process now requires that Mr. Yell’s conviction be vacated.

ARGUMENT

I. APPLICABLE STANDARD

A party is entitled to a new trial under CR 60.02(f)¹¹ upon presenting new evidence that, if presented originally, would have, with reasonable certainty, resulted in a different outcome at trial. *See Bedingfield v. Commonwealth*, 260 S.W.3d 805, 815 (Ky. 2008) (reviewing a motion for new trial under both CR 60.02(f) and RCr 10.02); *Brown v. Commonwealth*, 932 S.W.2d 359, 362 (Ky. 1996) (citing *Jones v. Commonwealth*, 269 Ky. 779 (1937)) (noting that under the common law writ of *coram nobis*, for which CR 60.02(f) is a substitute, “a petitioner had to convince the court that ‘the real facts as later presented on application for the writ, rendered the original trial tantamount to none at all, and [enforcement of] the judgment as rendered would be an absolute denial of justice and analogous to the taking of life or property without due process of law’”). Relief under CR 60.02(f) is reserved for extraordinary circumstances, *see, e.g., Pate v. Dep’t of Corrections*, 466 S.W.3d 480, 491 (Ky. 2015) (citing *Brown*, 932 S.W.2d at 362), such

¹¹ CR 60.02 is applicable in criminal matters under RCr Rule 13.04.

as a conviction “based, at least in part, on suppositions that we now know to be fundamentally false.” *Bedingfield*, 260 S.W.3d at 813 (granting motion for new trial based on new, scientific DNA evidence).

In Mr. Yell’s case, the new understanding of fire science establishes that the admission of the Commonwealth’s now discredited fire expert testimony undermined the fundamental fairness of his entire trial. *See Ege v. Yukins*, 485 F.3d 364 (6th Cir. 2007) (admission of expert testimony without any foundation—that a bite mark on the victim established 3.5–million–to–one odds that Ege was the murderer—violated Ege’s due process right to a fair trial) (citations omitted); *Brown v. O’Dea*, 227 F.3d 642, 644-645 (6th Cir. 2000) (scientific expert testimony on a crucial issue that is later discredited can deprive a person of a fundamentally fair trial). This evidence discrediting the only “evidence” of arson on which Mr. Yell was convicted is an extraordinary circumstance justifying relief under CR 60.02(f). The opinions of the Commonwealth’s experts are the *only* evidence purportedly showing that the fire in Mr. Yell’s mobile home was intentionally ignited.

Moreover, the Commonwealth’s fire testimony was provided by so-called “experts” in this scientific field. The Government makes a special claim on the jury’s trust when it introduces scientific evidence because such evidence offers a truth that lay jurors cannot themselves draw from the facts. Nor are lay jurors capable of evaluating the underlying scientific validity of the evidence. *See State v. Krause*, No. CA-CR 2015-0326-PR, 2015 WL 7301820, at*5 (Ariz. Ct. App. Nov. 19, 2015) (“[C]ourts have recognized that jurors may give significant weight to scientific evidence.”).¹² Where the claims turn out to be without foundation, the adversarial

¹² *See, e.g., Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 595 (1993) (“Expert evidence can be both powerful and quite misleading because of the difficulty in evaluating it.”); *DePaepe v. Gen. Motors Corp.*, 141 F.3d 715, 720 (7th Cir. 1998) (“District courts must be careful to keep

process cannot serve its essential truth-seeking function. Where, as here, the court, the prosecutor, and defense counsel all operated under the false assumption that the fire science at issue was valid and reliable, there was no meaningful adversarial testing of what we now know to be false evidence. Thus, the introduction of the now discredited evidence, proffered to the jury as infallible “scientific” evidence of guilt, was so unfair it resulted in a “breakdown in the adversarial process” in violation of Movant’s due process rights. *See, e.g., Brecht v. Abrahamson*, 507 U.S. 619, 639 (1993) (“The Fourteenth Amendment prohibits the deprivation of liberty ‘without due process of law’; that guarantee is the source of the federal right to challenge state criminal convictions that result from fundamentally unfair trial proceedings.”) (Stevens, J., concurring)).

The discrediting of the very methodologies that served as the foundation of the Commonwealth’s “expert” opinions that the fire was incendiary is precisely the extraordinary circumstances requiring relief to vindicate Mr. Yell’s due process rights. *See Han Tak Lee v. Glunt*, 667 F.3d 397 (3d Cir. 2012) (scientific evidence on which conviction was obtained, but

experts within their proper scope, lest apparently scientific testimony carry more weight with the jury than it deserves.”); *United States v. Baller*, 519 F.2d 463, 466 (4th Cir. 1975) (“[A]n opinion that claims a scientific basis is apt to carry undue weight with the trier of fact”); *United States v. Addison*, 498 F.2d 741, 744 (D.C. Cir. 1974) (“[S]cientific proof may . . . assume a posture of mystic infallibility in the eyes of the jury or laymen”); *Chapman v. State*, 638 P.2d 1280, 1290 (Wyo. 1982) (“Jurors tend to give considerable weight to scientific evidence when presented by experts with impressive credentials.”); *Reed v. State*, 391 A.2d 364, 370 (Md. 1978) (“Lay jurors tend to give considerable weight to ‘scientific’ evidence when presented by ‘experts’ with impressive credentials.”); *see also* Dawn McQuiston–Surrett & Michael J. Saks, *Communicating Opinion Evidence in the Forensic Identification Sciences: Accuracy and Impact*, 59 HASTINGS L. J. 1159, 1188 (2008) (recognizing that “most jurors begin with an exaggerated view of the nature and capabilities of forensic identification”); Michael Mann, *The CSI Effect: Better Jurors Through Television and Science?*, 24 BUFF. PUB. INT. L. J. 211, 235 (2006) (discussing the unfortunate legal atmosphere where “the use of science, DNA in particular, is required to fix an injustice”); Tom R. Tyler, *Viewing CSI and the Threshold of Guilt: Managing Truth and Justice in Reality and Fiction*, 115 YALE L. J. 1050, 1072 (2006) (summarizing poll conducted by National Opinion Research Center).

that was subsequently exposed as false and unreliable, would “if proven, set forth [a] *prima facie* case for granting *habeas* relief by showing that admission of state’s fire expert testimony undermined fundamental fairness of petitioner’s entire trial, since testimony was premised on unreliable science and so was unreliable”); *c.f. United States v. Freeman*, 650 F.3d 673, 678–80 (7th Cir. 2011) (affirming grant of *habeas* relief based, in part, on false testimony); *Drake v. L.A. Portuondo*, 553 F.3d 230, 233 (2d Cir. 2009) (affirming grant of *habeas* relief based on false expert witness testimony).

Improper admission of evidence constitutes a denial of fundamental due process when that evidence was material to the outcome, such that it played a crucial, critical, and highly significant factor in securing the conviction. *See Brown*, 227 F.3d at 644-645.¹³ A defendant’s fundamental right to due process requires that the prosecution may not present the jury with inaccurate or misleading evidence. *See United States v. Scheffer*, 523 U.S. 303, 308 (1998); *Caldwell v. Mississippi*, 472 U.S. 320, 340 (1985); *Burr v. Florida*, 474 U.S. 879, 881 (1985) (Marshall, J., dissenting) (“If a convicted defendant can produce sufficient indication that the jury’s finding of guilt beyond a reasonable doubt was wrong, the institutional need for finality yields to the more compelling concerns of truth and fairness.”). An order granting Mr. Yell’s motion and ordering a new trial under CR 60.02(f) would protect his due process rights and avoid a substantial miscarriage of justice. *See Bedingfield*, 260 S.W.3d at 814-15.

¹³ As mentioned above, there can be no legitimate dispute that the testimony of the Commonwealth’s fire “experts” was material to Mr. Yell’s conviction for arson, which requires a finding of intent. There was no other evidence of intent, which is confirmed by the jury’s verdict finding Mr. Yell guilty of second degree manslaughter (requiring a “wanton” mental state) but *not guilty* of murder (which similarly requires intentional conduct). *See* Pen. Code § 501.020 (defining mental states applicable in the Ky. Penal Code).

II. THE UNRELIABILITY OF UNCONFIRMED CANINE ALERTS TO DETECT ACCELERANTS HAS DEPRIVED MR. YELL OF DUE PROCESS.

One of the primary evidentiary underpinnings of the case against Mr. Yell stemmed from the testimony of a police ADC handler, Deputy Sheriff Buster Cannon of the Georgetown Fire Department, regarding his canine's detection of accelerants at the scene. The evidence presented at trial revealed that the ADC used in Mr. Yell's case, PJ, identified six locations for the presence of ignitable liquids. Samples from all six locations, however, later tested **negative** for the presence of ignitable liquids. Nevertheless, the trial court permitted the Commonwealth to present extensive evidence of the ADC's uncorroborated identification of the presence of ignitable liquids following a hearing pursuant to *Daubert*, 509 U.S. 579. The court further permitted PJ's handler, Deputy Sheriff Cannon, to provide extensive testimony regarding his subjective beliefs as to the accuracy of PJ's detection abilities, which was also uncorroborated.

In the years since Mr. Yell's trial, the use of ADC findings without laboratory confirmation has been found to be entirely unreliable. In fact, in 2012, CADA, the largest organization of professional ADC handlers, finally recognized that ADC alerts *without* laboratory confirmation are unreliable for use in court. Because the ADC's identification of accelerants was not supported by proper laboratory confirmation, critical evidence presented to the jury to prove arson was unreliable and Mr. Yell was deprived of a fundamentally fair trial. As a result, Mr. Yell is entitled to a new trial during which the unreliable ADC evidence will be excluded or severely limited.

1. The Accelerant-Detection Canine Alerts Are Unreliable.

On direct appeal, the Kentucky Supreme Court questioned whether a *Daubert* analysis applied to the ADC alert evidence in light of its prior ruling in *Debruler v. Commonwealth*, 231 S.W.3d 752 (Ky. 2007). *See Yell v. Commonwealth*, 242 S.W.3d 331 (Ky. 2007). In *Debruler*,

the Supreme Court ruled that evidence concerning a dog's *scent tracking* was not a scientific procedure subject to *Daubert* because the evidence was limited to the officer's observations of the dog. *Debruler*, 231 S.W.3d at 757. Thus, the Court reasoned that canine scent tracking was based on "experience-based knowledge," and was not a "technique amenable to peer review or scientific standards and testing." *Id.* at 757.¹⁴ Regardless of whether *Daubert* or *Debruler* applies to ADC alert evidence, both standards require that the proffered evidence be reliable to be admissible. *See Debruler*, 231 S.W.3d at 757 ("While a *Daubert* hearing is not necessary to admit canine scent tracking testimony, certain foundational requirements must nonetheless be met **in order to ensure reliability.**") (emphasis added); *Daubert*, 509 U.S. at 590 (evidence is deemed reliable if it is "derived by the scientific method" and appropriately validated through widely accepted scientific methods) (adopted by *Goodyear Tire and Rubber Co. v. Thompson*, 11 S.W.3d 575, 578–79 (Ky. 2000)).

¹⁴ The use of canines in *Debruler*, however, is distinguishable from the use of canines in Mr. Yell's case, undermining the reasoning by the Supreme Court that *Daubert* did not apply to the admission of Cannon's testimony. *Debruler* considered whether evidence of a dog's scent tracking was scientific evidence subject to a *Daubert* analysis. Here, however, both the canine and the handler must be properly trained and certified to allow the canine to detect fire accelerants, and a documented methodology must be known and employed when investigating a scene potentially involving such accelerants. This training and methodology is subject to scientific testing techniques, like peer review. *See* NFPA 921 (2015) §§ 17.5.4-17.5.4.7.9.

The ADC evidence in this case is distinguishable from the scent evidence in *Debruler*, and is comparable to the use of canines for bomb or drug detection, which *does* require a *Daubert* analysis. *See, e.g., U.S. v. Beltran-Palafox*, 731 F. Supp. 2d 1126 (D. Kansas 2010) (analyzing the admissibility of evidence of a drug-sniffing dog under *Daubert*); *U.S. v. Graham*, Case No. 08-CR-6259L, 2011 WL 1457131 (conducting a *Daubert* hearing regarding whether evidence of a dog's nitrate sniffing abilities for the presence of guns was admissible); *People v. Puertas*, Case Nos. 224173, 224286, 2002 WL 31160304 (Mich. Ct. App. Sept. 27, 2002) (considering the admissibility of evidence of drug-sniffing dogs under *Daubert* and Michigan's standard for admitting scientific evidence). In all such techniques, canines are used to specifically identify substances. Such investigation methods involve much more technical knowledge than a dog merely tracking someone's scent—something that canines are biologically equipped to do, as in *Debruler*. Identifying the presence of specific substances, on the other hand, requires training.

a. Since Mr. Yell’s Trial, the Scientific Community Has Firmly Concluded that Evidence of Unconfirmed ADC Alerts Is Unreliable.

In the years following Mr. Yell’s trial, the scientific community has deemed the ADC technique utilized in Mr. Yell’s case unacceptable due to the unreliability of canine detection without laboratory confirmation. Questions regarding the accuracy of unconfirmed ADC alerts began to come under scrutiny in the late 1990’s. Since then, however, national agencies and courts throughout the county have widely accepted that ADC alerts without laboratory confirmation are wholly unreliable due to the high probability of false positives.

The International Association of Arson Investigators (“IAAI”),¹⁵ National Fire Protection Association (“NFPA”), and Canine Accelerant Detection Association (“CADA”)¹⁶ all warn against the admission of ADC alerts without laboratory confirmation due to a canine’s inability to discriminate between ignitable liquids canines are trained to detect, and the chemically-similar gasses released by the burning of ordinary household products. NFPA 921 § 15.5.4.7.1. (2014); S. Katz et al., *Unconfirmed Canine Accelerant Detection: A Reliability Issue in Court*, 43(2) J. FORENSIC SCIENCE 329 (1998); M. Kurtz et al., *Effect of Background Interference on Accelerant Detection Canines*, 41(5) J. FORENSIC SCIENCE 868 (1996); CADA, *CADA’s Position on “Testifying to Negative Samples,”* <http://cadafiredogs.com/wp-content/uploads/2012/01/CADAS-Position-on-Testifying-to-Negative-Samples.pdf>.

¹⁵ The International Association of Arson Investigators is an international professional association of more than 8,000 fire investigation professionals, united by a strong commitment to suppress the crime of arson through professional fire investigation. See IAAI, *About IAAI*, <https://www.firearson.com/About-IAAI/> (last accessed June 6, 2016).

¹⁶ CADA is an open organization dedicated to maintaining the highest standards of professional handlers in the field of accelerant detection canines. Its aim is to provide support for all involved in education, health, and training of our canine partners while providing guidelines to promote professionalism, integrity, and the standards it represents. See CADA, *Mission Statement*, <http://www.cadafiredogs.com/who-we-are.html> (last accessed June 6, 2016).

The NFPA 921 guide specifically provides:

In order for the presence or absence of an ignitable liquid to be scientifically confirmed in a sample, that sample should be analyzed in a laboratory . . . *Any canine alert not confirmed by laboratory analysis should not be considered validated.*

NFPA 921 § 15.5.4.7.1. (2014) (emphasis added).

Similarly, CADA's 2012 position statement provides:

The Canine Accelerant Detection Association (CADA) does not support, nor do we recommend, Accelerant Detection Canine Handlers testifying in criminal or civil court to the presence of an ignitable liquid without having received confirmation through laboratory analysis. . . . *[O]ur position is that no Prosecutor, Attorney or ADC Handler should ever testify or encourage testimony that an ignitable liquid is present without confirmation through laboratory analysis.*

CADA, *supra*. While the IAAI and NFPA initially warned against the admissibility of unconfirmed ADC alerts in 1994 and 1996, respectively, CADA (the oldest and largest national professional organization involving ADCs in the United States) did not adopt regulations concerning unconfirmed ADC alerts until 2012.

Aside from problems with a canine's inability to discriminate, recent studies have further undermined the reliability of ADC alerts as a result of handler bias. A 2009 study conducted by researchers at the University of California at Davis that tested whether a dog handler's subjective beliefs as to the existence of ignitable liquids affects the canine's detection of such liquids found that the beliefs of dog handlers severely undermined the reliability of canine alerts and increased the rate of false-positive alerts. Lisa Lit et al., *Handler Beliefs Affect Scent Detection Dog Outcomes*, 14 ANIMAL COGNITION 387 (2011). These results help shape the broader opinion of the fire investigator community regarding the use of ADCs when examining crime scenes. *Id.* The results also severely undermine the reliability of the ADC evidence presented in Mr. Yell's case. *See* Sec. II.b., *infra*.

In the last decade, courts throughout the country consistently have accepted the guidelines set forth by IAAI, NFPA and CADA when analyzing proffered fire science evidence, as opposed to the rare reliance on such organizations in prior years. Courts specifically considering the reliability of ADC evidence have now widely held that ADC alerts unconfirmed by a subsequent laboratory analysis are unreliable, and thus, inadmissible. See *United States v. Hebshie*, 754 F. Supp. 2d 89 (D. Mass. 2010) (holding that the failure to object to unconfirmed ADC alerts under *Daubert* constitutes ineffective assistance of counsel); *United States v. Myers*, No. 3:10-00039, 2010 WL 2723196, at *4 (S.D.W.Va. July 8, 2010) (excluding evidence of a dog's alerts unconfirmed by laboratory tests, as required by NFPA standards); *State v. Sharp*, 395 N.J. Super. 175 (Law Div. 2006) (finding ADC alerts unreliable, likely to mislead the jury, prejudicial, and thus, inadmissible)..

For example, in *State v. Sharp*, 395 N.J. Super. 175 (Law Div. 2006), the court relied on NFPA 921 and other scholarly literature in accordance with the NFPA guide, finding that evidence of an ADC's alert to certain locations at a fire scene that was uncorroborated by laboratory testimony must be barred. *Id.* at 186.

In *United States v. Hebshie*, 754 F. Supp. 2d 89 (D. Mass. 2010), the United States District Court vacated a conviction of arson, in part because of the scientific literature regarding false ADC detections. Specifically, the court noted that the failure of defense counsel to object to ADC evidence uncorroborated by a laboratory analysis under *Daubert* severely prejudiced the defendant's case. The court held:

There is also a "reasonable probability" that the Court would have excluded the canine testimony or severely limited it. If the laboratory accelerant test were excluded, the canine alert would also have been excluded. NFPA 921 § 14.5.3.5 warns: "Any canine alert not confirmed by laboratory analysis should not be considered validated." If the dog alerts on a specific spot, the investigators know there is a better chance that laboratory analysis will reveal the presence of an

accelerant. *But without laboratory corroboration, the canine alert is questionable.* See *Carr v. State*, 267 Ga. 701, 482 S.E.2d 314, 318 (1997), (overturning a murder conviction because laboratory sample tested negative for the presence of accelerants), (overruled on other grounds by *Clark v. State*, 271 Ga. 6, 515 S.E.2d 155 (1999)). In any event, apart from the laboratory test, if, at a *Daubert* hearing, the government had presented an offer of proof mirroring [the handler’s] testimony, there is no question that testimony would have been severely limited or excluded and if it had not been excluded or limited before the trial, it would have been excluded afterwards as [the handler] began to wax poetic about his dog’s unique prowess.^[17] As noted above, NFPA 921 and the scientific literature have accepted canine alerts only as tools to help investigators narrow the search area. [The handler’s] testimony went far beyond that.

Id. at 124. Accordingly, such ADC evidence “should not reach the jury at all, as the “scientific literature cast doubt on the significance of the dog’s failure to alert (false negatives) and even raised concerns about canine ‘proficiency’ testing.” *Id.* at 94. In the years since Mr. Yell’s trial, evidence of ADC alerts without appropriate laboratory confirmation has been deemed unreliable, and thus, inadmissible.

The ADC evidence at Mr. Yell’s trial included details concerning PJ’s unconfirmed alerts for the presence of accelerants—the exact type of evidence that fire investigatory organizations and the courts have deemed unreliable. Deputy Sheriff Cannon testified that PJ alerted him to six locations in the home that may have contained ignitable liquids. The samples were subsequently tested to determine whether the samples identified by PJ contained ignitable liquids. **The laboratory results for all six samples were negative.** Since Mr. Yell’s trial, both the scientific community and other jurisdictions have specifically recommended excluding such

¹⁷ Despite the fact that the lab did not confirm any of PJ’s six alerts as containing ignitable liquids, Cannon twice told the jury he believed that “Dogs can detect accelerant at a lower level than current lab technologies. I don’t have proof, but they can.” Cannon Tr. Test. Feb. 14, 2006 at 05:13, and at 05:20; see also Bieber Decl. ¶ 19 fn. 52. This *ipse dixit* testimony is precisely the type of evidence courts hold to be unfair and should not be presented to a jury, as it is untethered to much more empirically reliable evidence, such as laboratory testing. “The ability to confirm the presence of these [accelerant] liquids at 15-20 parts per million is state of the art science.” *Yell v. Commonwealth*, 242 S.W.3d 331, 343 (Ky. 2007) (dissent).

unconfirmed ADC alerts due to their lack of scientific validity. Thus, the unconfirmed ADC evidence in Mr. Yell's case cannot be used to support the conviction against him, and a new trial must be granted.

The false positives identified by PJ in Mr. Yell's case are common when utilizing ADCs in arson investigations. Indeed, the IAAI, NFPA and CADA guidelines were all implemented to ensure that evidence of false positives is *not* presented to the trier of fact as it is likely to prejudice the defendant. If an ignitable liquid is present, a canine can alert to such liquids; however, the canine will also alert its handler to common household products that release the same chemicals during pyrolysis,¹⁸ commonly referred to as "pyrolysis products." *See, e.g., Hebshie*, 754 F. Supp. 2d at 124; J. Lentini, *Evolution of Investigation*, *supra* at 3. The canine cannot differentiate between the two products. As the purpose of ADC alerts is to help identify whether a fire was intentionally set or not, the inability to reliably differentiate ignitable liquids from common pyrolysis negates any probative value of such ADC evidence.

In Mr. Yell's case, false positives were confirmed by the laboratory analysis. Mr. Yell's home was full of common pyrolysis products, such as burned plastics, bedding, upholstered furniture, carpet and carpet padding. Bieber Decl. ¶ 81. PJ could not distinguish these household pyrolysis products from fire accelerants, as all six samples identified by PJ tested negative for accelerants. As a result, the unconfirmed ADC alerts cannot support Mr. Yell's conviction; indeed, the opposite is true. The lack of confirmation strongly suggests an accidental fire. "Yet, in closing argument, the Commonwealth drove home PJ the dog's opinion at least five times, even though the KSP forensic lab results indicated that there were *no ignitable liquids* on a single scrap from the trailer." *Yell v. Commonwealth*, 242 S.W.3d 331, 344 (Ky. 2007)

¹⁸ Pyrolysis is the decomposition of organic materials in the presence of heat, such as a fire.

(dissent).

Because the scientific community and courts throughout the country have deemed unconfirmed ADC alerts unreliable in the years following Mr. Yell's trial, due process requires that Mr. Yell receive a new trial excluding such faulty evidence.

b. Testimony Regarding the ADC Handler's Subjective Beliefs Was Also Unreliable and Prejudicial.

The decisions in *Hebshie* and *Sharp* also warn against the admission of canine handler testimony regarding his or her subjective thoughts as to the accuracy of the canine's alerts. *Hebshie*, 754 F. Supp. 2d at 93;¹⁹ *Sharp*, 395 N.J. Super. at 186.²⁰ Here, Cannon was permitted to testify regarding his subjective belief that canine alerts were more accurate than laboratory analysis without any substantiation. *See* Cannon Tr. Test. Feb. 14, 2006, 5:13-5:20 ("Dogs can detect accelerants at a lower level than current lab technologies. I don't have proof, but they can."). Cannon also testified regarding his "expert" interpretation of PJ's actions (such as PJ not being "concerned about working that hard"), and PJ's death by car before Mr. Yell's trial. (*Id.* at 4:25, 4:28.) As dictated by *Hebshie* and *Sharp*, ADC evidence must be limited to the canine's alerts and the subsequent laboratory confirmation.²¹ Cannon's testimony went far beyond the

¹⁹ The court in *Hebshie* discussed how the canine handler should not have been permitted to testify concerning the handler's interpretation of the canine's reactions to alerts, "unsubstantiated claims about the dog's accuracy," or the handler's "emotional relationship with the dog." *Id.* at 93.

²⁰ "The scientific theory at issue—that a dog's nose is more accurate than laboratory equipment—is simply not supported by experts on fire causation, by scientific literature on the subject, or by judicial opinions. Such a tenuous scientific foundation must be subjected to intense scrutiny in a criminal trial where the liberty interest of the accused are at stake." *Sharp*, 395 N.J. Super. at 186.

²¹ Evidence beyond the ADC alerts and laboratory confirmation was also inadmissible under Kentucky Rule of Evidence 403, which precludes evidence if its probative value is substantially outweighed by risk of prejudice, juror confusion or misleading the jury, or delay. The ADC evidence against Mr. Yell served no probative value, as all of the samples from the canine alerts

scope of proper scientific testimony under *Daubert*.

As mentioned above, science has proven that, when making alerts, ADCs are susceptible to their handlers' subjective beliefs, which leads to unreliable results. Lit et al., *Handler Beliefs*, *supra*. Consistent with these findings, Cannon's subjective beliefs, based on false assumptions regarding burn patterns and the presence of accelerants, likely influenced PJ to make false alerts.

Cannon testified that he initially examined the exterior and interior of the home without PJ by conducting the same burn pattern analysis as Gregory, Flowers and West, without accounting for "flashover." Cannon Tr. Test. Feb. 14, 2006, 5:17. Cannon effectively placed "red flags" in *multiple* areas based on faulty burn pattern analysis. Cannon then reentered the home with PJ, allowing PJ to freely examine the interior of the home, during which time PJ did *not* alert to the presence of any ignitable liquids. *Id.* at 4:27. It was only when Cannon put PJ on a shorter leash and directed PJ to areas *that Cannon deemed suspicious* from his initial examination (i.e. the red-flagged areas) that PJ alerted. *Id.* 40:28 ("Then I tried to direct and she started making alerts.").

Cannon further testified that if PJ gave him an alert that he deemed satisfactory, he would give PJ a treat. If PJ did not provide an alert, she was not fed.

The results of the University of California study, and the fact that none of the samples taken where PJ alerted tested positive for the presence of ignitable liquids, show that Cannon's testimony, including his faulty application of pre-flashover burn pattern analysis, is unreliable and cannot support Mr. Yell's conviction.

ultimately tested negative for accelerants. The additional testimony of Cannon likely led to juror confusion. For example, Cannon's testimony regarding his baseless belief that canine alerts are more accurate than laboratory tests is not rooted in scientific fact. Moreover, Cannon's testimony regarding PJ's death ("man's best friend") merely pulled at the heart strings of the jury; it did not serve any probative purpose.

III. THE INDICATORS OF ARSON RELIED ON BY THE COMMONWEALTH’S EXPERTS IN FORMING THEIR OPINIONS THAT THE FIRE WAS INTENTIONALLY SET ARE NOW KNOWN TO BE UNRELIABLE, AND THEIR ADMISSION DENIED ROBERT YELL DUE PROCESS.

All four of the Commonwealth’s fire experts based their opinions of ultimate fact—that the fire in Mr. Yell’s trailer was intentionally ignited—on two shared beliefs: (1) that ignitable liquid was present in three rooms of the mobile home (the bedroom, kitchen and living room), and (2) that the fire had three, separate places of origin. *See* Bieber Decl. ¶ 11, fn. 2-4.²² The basis for each of these opinions has been scientifically disproven and shown to be unreliable. As a result, Mr. Yell’s conviction, based on these unfounded opinions that the fire in the trailer was ignited intentionally, is unfair and violative of due process.

All of these opinions are based on the incorrect understanding of, and failure to account for, flashover. Flashover is “[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 § 3.3.83; *see also* Bieber Decl. ¶ 24. The analysis performed by the Commonwealth’s fire experts did not account for flashover, but instead used “pre-flashover” burn pattern analysis that has been proven unreliable for analyzing post-flashover fires. *See* Bieber Decl. ¶¶ 36-46.

The importance of flashover as fundamental to the methodology and reliability of fire

²² Notably, Investigator West initially believed there were six origination sites in the mobile home, apparently because the ADC alerted in six locations and six samples were sent to the laboratory for testing. West Tr. Test., Feb. 15, 2006, 2:49:54 – 2:52:30. When *none* of the six samples tested indicated the presence of accelerants, West testified that he changed his opinion, and believed there to be only three sites of origin. *Id.* West’s modified opinion is inherently flawed. Initially, he based his opinion on origination due to alerts by the ADC (i.e., purported presence of accelerants), and then, when none of the samples showed any accelerants where the ADC alerted, West changed the basis for his opinion, to the conclusions drawn by Gregory and Flowers.

science was only recently confirmed. *See* Lentini, *Evolution of Investigation, supra*, at 4-7; *see also* Bieber Decl. ¶¶ 24-65. It is now widely accepted that the unreliability of fire indicators grows exponentially with each second after flashover. *See, e.g.,* Lentini, *Evolution of Investigation, supra*, at 7 (discussing the 2007 study by the ATF that tested investigator’s accuracy 30, 70 and 180 seconds after flashover, and finding an accuracy rate of only 75% after just 180 seconds post-flashover).

The failure to account for flashover undermines the opinions offered by the Commonwealth’s experts in Mr. Yell’s trial.

a. Opinions That Only Liquid Accelerants Can Produce the Heat Required to Cause Certain Kinds of Damage Are False and Unreliable.

At trial, the Commonwealth’s experts all falsely assumed that only ignitable liquid could result in heat intense enough to burn through flooring in the mobile home. *See* Bieber Decl. ¶ 66, fn. 42. As with so many other false assumptions nonetheless introduced as scientific fact discussed above, this assumption has been widely discredited and proven false, as specifically noted in section 6.6.6.2.5 of NFPA 921. *See* R. Ogle, et al., *The Scientific Investigation of Arson Fires, Exponent Failure Analysis Associates, FIRE AND CASUALTY* (Nov. 2003) at 125. “Holes in floors may be caused by glowing combustion, **radiation**, or an ignitable liquid . . . Evidence other than the hole or its shape is necessary to confirm the cause of a given pattern.” NFPA 921 § 6.6.6.2.5 (2014) (emphasis added). Moreover, “[f]ull room involvement [flashover] can result in holes burned through carpet and floor coverings. . . . the extreme conditions of the full room involvement can produce major damage in a few minutes, depending on ventilation and fuels present.” NFPA 921 § 6.3.2.4. Research further confirms that “[i]n free-burning, preflashover fires, floor burn-through patterns are most likely caused by solid fuel fires. **Liquid fuel fires do not penetrate floors in free-burning fires. Therefore, floor burn-through patterns are not**

probative evidence of an incendiary fire started with an ignitable liquid.” R. Ogle, et al., *supra*, at 125 (citing results of a 2003 study) (emphasis added). The scientific finding that floor burn-throughs do *not* correlate to the presence of ignitable liquid means that the opinions of the Commonwealth’s experts are now known to be unreliable. If proffered today, such opinions would not be admissible. *See* KY. RULE OF EVID. 702 (2) (requiring expert testimony to be “the product of reliable principles and methods”).

The new scientific conclusions regarding the causes of floor burn-throughs corroborate the factual evidence in Mr. Yell’s case, which indicated that the fire was *not* intentionally ignited. Specifically, the evidence at trial, including the testimony of first-responding firefighters, indicated flashover occurred. *See* Poole Tr. Test. Feb. 13, 2006, 2:56:30 – 2:59:18; Bieber Decl. ¶¶ 49-52. Thus, the Commonwealth’s fire experts’ beliefs regarding the presence of ignitable liquid where the floor was burnt-through are (a) undermined by the scientific findings that liquid fires do not generate floor-burn throughs, and (b) methodologically flawed because they fail to account for the fact that a flashover fire likely caused the burns through the floor. Due process requires consideration of these now well-established scientific findings regarding floor burn-throughs and flashover. When applied, these findings discredit the Commonwealth’s experts’ opinions on which Mr. Yell was convicted, such that it is reasonably certain that, had these findings been present at trial, a different outcome would have resulted.

b. Burn Pattern Analysis Without Accounting for Flashover Is Unreliable.

The Commonwealth’s experts also falsely assumed that burn patterns (patterns of charring) that were not clearly visually connected meant there were multiple places from which the fire originated, thereby concluding that the fire was intentionally set. This old “rule of thumb” has been discredited; flashover undermines the underlying assumption that all fire only burns upward. *See* NFPA 921 § 6.3.2.2.

Analysis of burn patterns is now known to be unreliable in post-flashover fires. At least three studies conducted after Mr. Yell's conviction have produced findings demonstrating that burn pattern analysis is entirely unreliable once flashover occurs, and no studies have been conducted that even purport to support the State's theory of arson. See Steven W. Carman, *Science Trumps Art In Fire Investigations*, 74(7) TEXAS BAR JOURNAL 587, 590 (July 2011); Steven W. Carman, *Improving the Understanding of Post-flashover Fire Behavior*, PROC. OF THE INT'L SYMP. ON FIRE INVESTIGATION SCIENCE AND TECH., 2008, Sarasota, Fla.; Steven W. Carman, "Progressive Burn Pattern Development in Postflashover Fires," *Proceedings of Fire and Materials* (2009), Interscience Communications, London, UK,²³ see also Lentini, *Evolution of Investigation, supra*, at 6-7. Most recently, researchers at Eastern Kentucky University found that surveyed fire investigators were only 75% accurate in identifying the area of origin of a fire that was allowed to burn only 1 minute past flashover. See Andrew T. Tinsley & Gregory E. Gorbett, *Fire Investigation Origin Determination Survey*, PROC. OF THE INT'L SYMP. ON FIRE INVESTIGATION, SCIENCE AND TECH. (2012), 53-68.²⁴ Other research has shown that just two-minutes of post-flashover burn significantly eliminates reliability of burn patterns to identify a source of origin or infer whether a fire was intentionally set. See e.g., Lentini, *Evolution of Investigations, supra*, at 6-7. In short, pre-flashover burn pattern analysis is no longer a reliable method for drawing conclusions regarding the location of origin for fires that may have reached flashover.

²³ Copies of these reports documenting the accuracy of burn pattern analysis in post-flashover fires are available at retired ATF Special Agent, Steven W. Carman's website: <http://carmanfireinvestigations.com/publications/>.

²⁴ Available at http://fireandarsoninvestigation.eku.edu/sites/fireandarsoninvestigation.eku.edu/files/origin_survey_resubmission.pdf

The opinions of the Commonwealth's experts rely merely on the discredited assumption that all fire burns up. They do not account for flashover at all, and their failure to do so makes those expert opinions methodologically flawed given the new understanding of fire behavior.

The failure to account for flashover is particularly important in this case, where a number of factors indicate that the fire reached flashover: (1) the increased heat due to the model of mobile home from the 1970's; (2) the extent of floor-to-ceiling burn damage in each room; (3) the witness statements confirming that flames were ventilating through windows of the bedroom and the living room, and through the door; and (4) the extent to which interior and exterior walls were burned through. *See* Bieber Decl. ¶ 51. Investigator Gregory's testimony that he "could not connect this fire [in the living room] with this fire in the bedroom" exemplifies how the Commonwealth's fire experts' investigation was methodologically flawed because they assumed that all fire burns up and failed to account for flashover. *See* Bieber Decl. ¶¶ 54-57.

There can be no legitimate dispute that the testimony of the Commonwealth's fire experts materially impacted the jury's decision to convict Mr. Yell of arson. No other evidence was presented to establish that the fires were intentionally ignited. Therefore, in light of the fire science community's greater understanding of flashover and how it discredits the past practices of burn pattern analysis, it is reasonably certain that the outcome of Mr. Yell's trial would have been different if such information was presented at trial. Upholding Mr. Yell's conviction for arson on the basis of such unreliable opinion testimony would violate his right to due process. *See e.g., Han Tak Lee*, 798 F.3d at 166-69; *Souliotes*, 2012 WL 1458087 at *18-22.

CONCLUSION

The undeniable advances in fire investigation science since Mr. Yell's trial and the guidelines and principles adopted by the National Fire Protection Association, the International Association of Arson Investigators, and the Canine Accelerant Detection Association, all show

that the outmoded investigative techniques that led to Mr. Yell's conviction were unreliable and based more on myth than science. The ADC's six uncorroborated alerts and his handler's testimony regarding his subjective belief (without any proof) that the canine's alerts were more accurate than laboratory analysis—evidence which the Commonwealth exploited in closing argument—would not be admissible in a new trial. Furthermore, the Commonwealth's fire investigator testimony based on debunked assumptions regarding liquid accelerators and unreliable burn pattern analysis that did not account for flashover, would also be inadmissible in a new trial. When these advances in fire science are accounted for, it is reasonably certain that, had these advances been known and presented at trial, the outcome would have been different.

Since Mr. Yell's conviction is based on suppositions that we now know to be fundamentally false, he should be granted relief under CR 60.02(f), and his conviction and sentence should be vacated.

Respectfully submitted,

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