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Marc Price Wolf

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Habeas Relief From Bad Science: Does Federal Habeas Corpus Provide Relief for Prisoners Possibly Convicted on Misunderstood Fire Science?

Marc Price Wolf*

INTRODUCTION

Since the rise of deoxyribonucleic acid ("DNA") testing technology in the last two decades, courts and lawmakers in forty-three states have modified their legal systems to allow legal challenges to old convictions based on DNA testing.[1] These statutes create the possibility that factually innocent prisoners can be exonerated through DNA testing. DNA testing has been embraced by most courts and legislatures because the testing allows scientists to make reliable conclusions about matching one sample of DNA to another.[2]

Yet biological evidence suitable for DNA testing only exists in roughly ten to twenty percent of all criminal cases.[3] Although DNA testing might be the panacea for innocent prisoners within this ten to twenty percent, in non-DNA cases, prisoners must find alternative methods to challenge their convictions. For instance, what happens when an individual is convicted largely on the basis of scientific conclusions that were

* Marc Price Wolf is a law clerk for Judge Claudia Wilken, United States District Court, Northern District of California.

1. *See* The Innocence Project, Access to Post-Conviction DNA Testing, http://www.innocenceproject.org/Content/304PRINT.php (last visited Sept. 8, 2008) (noting that forty-three states have post-conviction DNA testing statutes); *see also* Kathy Swedlow, *Don't Believe Everything You Read: A Review of Modern "Post-Conviction" DNA Testing Statutes*, 38 CAL. W. L. REV. 355 (2002) (praising the enactment of these state statutes while noting their possible flaws).

2. *See generally* D. H. Kaye, *The Forensic Debut of the National Research Council's DNA Report: Population Structure, Ceiling Frequencies and the Need for Numbers*, 34 JURIMETRICS J. 369 (1994) (analyzing studies conducted to determine DNA testing accuracy).

3. *See* Daniel S. Medwed, *Up the River Without a Procedure: Innocent Prisoners and Newly Discovered Non-DNA Evidence in State Courts*, 47 ARIZ. L. REV. 655, 656 (2005).

grounded in now discredited science?

In contrast to DNA testing, which is a new form of technology that can test old physical evidence, scientific advancements that create a better understanding of the physical world, but do not necessarily allow for the testing of old physical evidence, are the subject of this article. Specifically, this article focuses on scientific advancements that have changed a fire investigator's understanding of the physical evidence surrounding arson. Many scientific methods once employed by arson investigators have now either been entirely discredited or at least severely questioned.[4] New methods for understanding fires and burn patterns have been developed, but often no evidence remains from old crime scenes to be tested with these new methods.

Part I of this article describes how the entire field of fire investigation has recently undergone a complete shift in methodology and foundational principles. At one time, the methods of fire investigators were rarely questioned. Now, newer generations of fire investigators are investigating whether old arson convictions were based on the inadequate methods of earlier fire investigators.

Part II of this article briefly describes the prevalence of arson in the United States and a few instances in which fire investigators relied on bad science to formulate the conclusion that a fire was of incendiary[5] origin. Thousands of people are arrested every year for committing arson,[6] but some of those individuals may actually be innocent.

Part III of this article describes how prisoners convicted of arson based on now-debunked theories can utilize habeas corpus relief. Though much of the old fire investigation methods and principles have changed, incorporating these changes into successful legal challenges to convictions is difficult. While understanding and mastering state habeas challenges to these

4. *See* Angelo L. Pisani, Jr., *Historical Perspective on Arson Evidence*, *in* PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON THE FORENSIC ASPECTS OF ARSON INVESTIGATIONS 3, 4 (1995) (commenting on past fire investigation literature and saying "much of it is not supported by science").

5. Throughout this article, the words "suspicious," "incendiary," and "arson" describe intentionally set fires.

6. *See* FBI, Crime in the United States 2005: Arson Table 2, http://www.fbi.gov/ucr/05cius/offenses/expanded_information/data/arsontable_02.html (last visited Nov. 26, 2008); FBI, Crime in the United States 2007: Table 29 Number of Arrests, http://www.fbi.gov/ucr/cius2007/data/table_29.html (last visited Nov. 26, 2008).

convictions is an important endeavor, this article focuses on federal habeas challenges. Even though federal habeas petitions are not necessarily the most valuable tool for a falsely imprisoned individual, this article focuses on this type of claim because it is often the last legal challenge available to prisoners, and is therefore, arguably, the most important. Also, because the science of fire investigation has changed so much since the early 1990s, prisoners challenging their arson convictions before that time have probably exhausted their direct appeals and state habeas corpus challenges.

Although this article analogizes the scientific advancements in using DNA evidence to identify individuals to the scientific advancements in understanding fires, the comparison has its limitations. DNA evidence can often be used to exonerate individuals and undermine cases factually. However, a new understanding of fire science will not as readily exonerate individuals convicted of arson. In some cases, scientific advancements in fire science might only partially call into doubt an arson conviction. Nonetheless, the comparison is helpful in understanding how the law can simultaneously recognize important scientific advancements and provide relief to some prisoners.

I. FIRE INVESTIGATORS

A. HISTORY OF FIRE INVESTIGATORS

Determining the cause of fires has been considered a special area of knowledge since at least "300 B.C. in Rome…. Roman law decreed that the *Quarstionarius*, the Roman equivalent of today's state fire marshal, determines the cause of all fires."[7] Though the study of fires began centuries ago, the field has been slow to evolve scientifically.[8]

For example, a 1955 publication includes a section titled, "How to discover whether a female caused the fire," which describes the "fairly recognizable traits or techniques in common" with female fire starters.[9] The book notes that "[f]emale fires tend to be a bit 'childish,' 'silly,' hasty, poorly planned[,] . . . [and are] often spur-of-the-moment, impulsive, and ill consid-

7. ARTHUR COTE, P.E., & PERCY BUGBEE, PRINCIPLES OF FIRE PROTECTION 2 (1988).

8. Pisani, *supra* note 4, at 3.

9. RAYMOND L. STRAETER & C. C. CRAWFORD, TECHNIQUES OF ARSON INVESTIGATION 110 (1955).

ered jobs."[10] The book also suggests that the fire investigator should seek out women who appear "frustrated," are having "[l]ove and marital troubles," are "pregnant," or are undergoing "menopause."[11] While one does not dispute that arsonists might have these characteristics, the fact that an arson investigation publication contains naïve conclusions based on unfounded gender stereotypes rather than scientific conclusions is indicative of a field in desperate need of reform.

Until recent decades, "fire investigators have considered the determination of origin and cause to be a mixture of art and science."[12] The scientific basis was grounded in knowledge of how various materials melt or ignite.[13] "The art consisted of interpreting a variety of burn patterns, along with inferences drawn from experience and material properties to locate the origin of the fire and its cause."[14]

A 1977 publication by the U.S. Department of Justice noted that the "[i]nterpretation of burn indicators is a principal means of determining the causes of fires" as well as "the most common method of establishing arson . . . ."[15] Yet the same publication recognized that "[a]lthough burn indicators are widely used to establish the causes of fires, they have received little or no scientific testing. There appears to be no published material in the scientific literature to substantiate their validity."[16] Notwithstanding this less than resounding endorsement, the Department of Justice detailed how an investigator should identify and analyze seven types of burn patterns: alligatoring effect, crazing of glass, depth of char, line of demarcation, sagged furniture springs, spalling, and freezing of leaves.[17]

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10. *Id.* at 111.

11. *Id.* at 113.

12. Richard L.P. Custer, *Considerations for Arson Investigations in NFPA 921—Guide for Fire and Explosion Investigations*, *in* PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON THE FORENSIC ASPECTS OF ARSON INVESTIGATIONS 31, 31 (1995).

13. *Id.*

14. *Id.*

15. JOHN F. BOUDREAU ET AL., ARSON AND ARSON INVESTIGATION: SURVEY AND ASSESSMENT 87 (1977).

16. *Id.* at 88.

17. The Department of Justice described seven burn indicators:

> Alligatoring effect: checkering of charred wood, giving it the appearance of alligator skin. Large, rolling blisters indicate rapid, intense heat, while small, flat alligatoring indicates long, low heat.

Despite the lack of scientific testing, these burn indicators became the tools of fire investigators "through the application of *post hoc ergo propter hoc* logic."[18] Combine this trend with the common practice of arson investigators learning their trade through apprenticeships, as opposed to a standardized curriculum, and it is easy to see how fallacious scientific conclusions permeate the field of fire investigations.[19] For instance, "if a hole were found in the floor after a fire where gasoline was known to have started or accelerated the fire, the presence of a hole in the next fire investigated indicated the use of gasoline in the second fire."[20] This conclusion is not necessarily correct because many aspects of a fire or the extinguishing process can create holes in floors.[21]

In the 1970s scientists began studying methods to "control the ignition, spread, and growth of fires in buildings," which are called compartment fires.[22] The research showed that many types of fires progress unpredictably, but compartment fires have particular characteristics.[23] In 1984 the National

> Crazing of glass: formation of irregular cracks in glass due to rapid, intense heat—possible fire accelerant.
>
> Depth of char: depth of burning of wood—used to determine the length of burn and thereby locate the point of origin of the fire.
>
> Line of demarcation: boundary between charred and uncharred material. On floors or rugs, a puddle shaped line of demarcation is believed to indicate a liquid fire accelerant. In the cross section of wood, a sharp, distinct line of demarcation indicates a rapid intense fire.
>
> Sagged furniture springs: because of the heat required for furniture springs to collapse from their own weight (1150ºF) and because of the insulating effect of the upholstery, sagged springs are believed to be possible only in either a fire originating inside the cushions) as from a cigarette rolling between the cushions) or an external fire intensified by a fire accelerant.
>
> Spalling: breaking off of pieces of the surface of concrete, cement, or brick due to intense heat. Brown stains around the spall indicate the use of a fire accelerant.
>
> Freezing of leaves: drying of leaves in a forest fire into their position at the time of the fire. Since leaves turn during the day to face the sun, their position indicates the time of day.

Id. at 87–88.

18. Custer, *supra* note 12. The Latin phrase "post hoc ergo propter hoc" means "after this, therefore because of this."

19. *Id.* at 32.

20. *Id.* at 31.

21. *Id.* at 32.

22. *Id.*

23. *Id.*; *see generally* DOUGAL DRYSDALE, AN INTRODUCTION TO FIRE DYNAMICS (1985); NAT'L FIRE PROT. ASS'N, NFPA 907M: MANUAL FOR THE DETERMINATION OF ELECTRICAL FIRE CAUSES (1988 ed. 1988) ("This manual is intended to provide methods to more clearly define the equipment and asso-

Fire Protection Association ("NFPA") formed a committee on fire investigation in order to unite the fire investigation and fire science communities to assess the science behind fire investigations.[24] The committee sought to create guidelines for investigators to use to determine the "origin and development" of intentionally set fires.[25]

In 1992, after incorporating over 280 comments from the fire protection and fire investigation community, the NFPA published the first edition of *NFPA 921: Guide for Fire and Explosion Investigations* ("Guide").[26] The NFPA most recently published the fifth edition of the Guide and is continually updating the Guide to keep pace with scientific advancements.[27] In 2000 the U.S. Department of Justice issued a research report entitled *Fire and Arson Scene Evidence: A Guide for Public Safety Personnel*, which stated that the Guide "has become a benchmark for the training and expertise of everyone who purports to be an expert in the origin and cause determination of fires."[28] The Guide is now recognized in courts around the country as the national standard of care for fire investigations.[29] Even though the Guide has existed for over a decade,

ciated cause of the fire once the investigation begins to focus on the electrical equipment.").

24. Custer, *supra* note 12, at 32.

25. *See id.* at 32–33.

26. *Id.* at 33.

27. The latest edition of NFPA 921: GUIDE FOR FIRE AND EXPLOSION INVESTIGATIONS was published in Spring 2008. *See* NFPA, NFPA Catalog, http://www.nfpa.org/catalog/product.asp?pid=92108&src=nfpa&order_src=A292 (last visited Oct. 10, 2008).

28. U.S. DEP'T OF JUSTICE, FIRE AND ARSON SCENE EVIDENCE: A GUIDE FOR PUBLIC SAFETY PERSONNEL 6 (2000).

29. *See e.g.*, Workman v. AB Electrolux Corp., No. 03-4195-JAR, 2005 U.S. Dist. LEXIS 16306, at *31 (D. Kan. Aug. 8, 2005) ("Martin developed his opinions based on the methodology set forth in NFPA 921, which represents the national standard with regard to appropriate methodology for investigation by fire science experts."); Ind. Ins. Co. v. Gen. Elec. Co., 326 F. Supp. 2d 844, 849–50 (D. Ohio 2004) ("NFPA-921 is a recognized guide for assessing the reliability of expert testimony in fire investigations."); Tunnell v. Ford Motor Co., 330 F. Supp. 2d 707, 725 (W.D. Va. 2004) ("Many courts have recognized NFPA 921 as 'a peer reviewed and generally accepted standard in the fire investigation community.'"); McCoy v. Whirlpool Corp., 214 F.R.D. 646, 653 (D. Kan. 2003) ("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."); Royal Ins. Co. of Am. v. Joseph Daniel Const., Inc., 208 F. Supp. 2d 423, 426 (S.D.N.Y. 2002) ("The NFPA 921 sets forth professional standards for fire and explosion investigations . . . ."); Chester Valley Coach Works v. Fisher-Price, Inc., No. 99 CV 4197, 2001 U.S. Dist. LEXIS

many fire investigators still employ scientifically disproved techniques to locate fire origins.[30]

B. BASIC UNDERSTANDING OF FIRE SCIENCE

A thorough understanding of fire science requires countless hours of study and training.[31] This section provides a brief overview of the science to introduce the reader to the basic principles of fire science. There are four basic components to any fire: "fuel, [an] oxidizing agent, . . . heat, and [an] uninhibited chemical chain reaction."[32] Taking away any one of these components will suppress a fire.[33]

Fuel can exist in various forms, and is defined as "any substance that can undergo combustion."[34] Fuel can exist as a solid, such as wood or plastic; it can exist as a liquid, such as gasoline; or it can exist as a vapor, such as natural gas.[35] "In most fire situations, the oxidizing agent is the oxygen in the earth's atmosphere."[36] However, chemical oxidizers, such as ammonium nitrate fertilizer can take the place of atmospheric oxygen.[37] The combination of fuel and oxidizing agent required to create a fire depends in large part on temperature. In higher temperatures, less oxygen is required, while in lower temperature environments, more oxygen is required.[38] At each temperature there exists a certain fuel/oxygen ratio range at which

15902, at *11 (E.D. Pa. Aug. 29, 2001) ("[The expert] acknowledges that NFPA 921 is *the authoritative comprehensive guide* to accepted procedures and techniques for fire investigations."); Travelers Prop. & Cas. Corp. v. Gen. Elec. Co., 150 F. Supp. 2d 360, 366 (D. Conn. 2001) (describing the NFPA 921 as "a peer reviewed and generally accepted standard in the fire investigation community"); Abon, Ltd. v. Transcontinental Ins., No. 2004-CA-0029, 2005 WL 1414486, at *10 (Ohio App. June 16, 2005) ("The National Fire Protection Association 921 Guide for Fire and Explosion Investigations ('NFPA 921') is a peer reviewed and generally accepted standard in the fire investigation community.").

30. *See* Custer, *supra* note 12, at 32 ("Many erroneous fire origins and cause indicators . . . . persist today . . . .").

31. NAT'L FIRE PROT. ASS'N, NFPA 921: GUIDE FOR FIRE AND EXPLOSION INVESTIGATIONS 921–15 (2004 ed. 2004) ("The body of knowledge associated with combustion and fire would easily fill several textbooks.").

32. *Id.*

33. *Id.*

34. *Id.*

35. *Id.*

36. *Id.* at 921–16.

37. *Id.*

38. *Id.*

combustion can occur.[39]

The heat component of a fire represents the amount of energy needed to sustain a fire. Heat "promotes fire growth and flame spread by maintaining a continuous cycle of fuel production and ignition."[40] An uninhibited chemical reaction results in "the rapid oxidation of a fuel, producing heat, light, and a variety of chemical by-products."[41]

An important concept in modern fire science is heat transfer. Heat transfer is the "transfer of heat energy from one point to another caused by a temperature difference between those points."[42] Understanding heat transfer is vital for arson investigators because heat transfer is responsible for much of the physical evidence left behind in a fire scene.[43] Once an arson investigator understands heat transfer and flame spread, the investigator can identify fire patterns, the nature of the flames, and heat and smoke movements in a structure.[44] Identifying these patterns helps investigators locate the point of fire origin.[45]

C. SCIENTIFIC DEVELOPMENTS IN UNDERSTANDING FIRES

Once scientists and researchers began to test the reliability of using burn patterns to determine the origin and progression of fires, many foundational principles of fire investigators were deemed incorrect. One of the most important conclusions reached by researchers is that certain types of compartment fires burn at predictable rates and in somewhat predictable patterns.[46] Yet these conclusions are drastically different from previously held beliefs among fire investigators.[47]

1. Flashover

"A fast-growing fire is often interpreted by investigators as

39. *Id.*
40. *Id.*
41. *Id.*
42. *Id.* at 921–17.
43. *Id.* ("Heat transfer is also responsible for much of the physical evidence used by investigators who attempt to establish a fire's origin and cause.").
44. *Id.* at 921–30.
45. *Id.*
46. *See generally* Custer, *supra* note 12, at 32–35.
47. *Id.*

an indicator of arson."[48] The rapid spread of fire was considered indicative of an accelerant and not a result of normal fire behavior.[49] However, the concept of a flashover describes how a non-incendiary compartment fire can spread at the same alarming rate that fire investigators once only attributed to arson.[50]

When a fire starts "in a compartment," such as a room in a building, "the smoke rises to the ceiling above the fire and spreads outward, forming a layer."[51] As the fire continues to burn, the smoke grows thicker and the temperature within that initial layer skyrockets.[52] If the layer reaches a temperature of roughly 1100°F, the fire reaches a flashover point, where any item near the layer of smoke could combust.[53] Postflashover burning may be responsible for low-wall burning, floor-burn patterns, and even holes in the floor.[54] Each of these indicators has been used by fire investigators in the past to conclude that a fire was incendiary in origin.[55] Moreover, a flashover can occur within one and one-half minutes from the initial spark or open flame.[56] Given the facts of the flashover phenomenon, fire investigators should no longer use these burn patterns alone to conclude that an accelerant was used in setting a fire.

2. Wood Charring

Early fire investigators associated certain types of wood char with the use of liquid accelerants.[57] In 1972 one author noted that "[t]he application of petroleum products to wood causes a deep burning. Smaller, deeper alligator effects appear than from charring by applied heat only."[58] A 1982 publication noted that "[g]enerally, alligatoring is smaller the closer one gets to the point of origin if the fire developed normally. . . . Large alligatoring should be considered an indication of the

48. *Id.* at 32.
49. *See* Pisani, *supra* note 4, at 5.
50. *See* Custer, *supra* note 12, at 32.
51. *Id.*
52. *Id.*
53. *Id.*
54. *See* Pisani, *supra* note 4, at 9.
55. *Id.*; *see* Custer, *supra* note 12, at 32.
56. NAT'L FIRE PROT. ASS'N, NFPA 921: GUIDE FOR FIRE AND EXPLOSION INVESTIGATIONS 921–18 (1995).
57. *See* Custer, *supra* note 12, at 34.
58. BENJAMIN S. HURON, ELEMENTS OF ARSON INVESTIGATION 28 (1976).

nearby presence of a flammable or combustible liquid."[59] As these comments suggest, it was widely believed that "the presence of large shiny blisters (alligator char) is proof that a liquid accelerant was present during the fire."[60] However, the Guide reported in 1995 that "[t]he appearance of the char and cracks has been given meaning by the fire investigation community beyond what has been substantiated by controlled experimentation"[61] and cautioned that fire investigators should not "claim indications of [an] accelerant on the basis of the appearance of the char alone."[62]

Also, fire investigators used to believe that fire charred at a rate of one inch in forty to forty-five minutes [63] and would use this rate to estimate burn times and to evaluate suspects' alibis. In actuality, rate of charring is a function of many independent factors such as the species of wood, the geometry of the material exposed, and the fire's ventilation.[64] In fact, charring rates vary from four-tenths of an inch to ten inches per hour.[65]

3. Spalling

"Spalling is a physical process of the breakdown of surface layers of masonry . . . which crumble into small pebble-like pieces in response to high temperatures and/or mechanical pressure."[66] Fire investigators used to conclude that spalling indicated arson.[67] "The use of spalling evidence [was] one of the most misunderstood and improperly used evidential elements" in fire investigations until fire investigators began us-

59. INT'L FIRE SERV. TRAINING ASS'N, FIRE CAUSE DETERMINATION 48 (1st ed. 1982).

60. NAT'L FIRE PROT. ASS'N, *supra* note 31, at 921–26.

61. *Id.*

62. *Id.*

63. *See* CHARLES L. ROBLEE ET AL., THE INVESTIGATION OF FIRES 37 (2d ed. 1988).

64. NAT'L FIRE PROT. ASS'N, *supra* note 56, at 921–26.

65. *See* DRYSDALE, *supra* note 23, at 182.

66. Cathleen E. Corbitt-Dipierro, *Fire Investigation Mythunderstandings: Examining Long-Held Truths About Fire Dynamics, Physical Indicators of Incendiary Fires, and Fire Investigation Techniques*, http://www.interfire.org/features/myths.asp (last visited Apr. 18, 2007).

67. *See* 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 38, http://www.innocenceproject.org/docs/ArsonReviewReport.pdf (last visited Apr. 18, 2007) [hereinafter INNOCENCE PROJECT ARSON REVIEW].

ing the Guide in the mid-to-late 1990s.[68] In reality, spalling can be the result of exposure to any high rate of heating or the rapid cooling of heated concrete.[69] Spalling alone is not an indication of arson.[70]

4. Collapsed Springs

Often, fire investigators will examine bed and couch springs and conclude that if bed springs were burned from underneath, this indicates that an accelerant must have been present underneath the springs.[71] This type of thinking fails to acknowledge the reality of a flashover, and assumes that since heat rises, any low burning must be from a source originating on the ground.[72] In fact, fire investigators who do not understand the concept of flashover often think floors should never burn through unless triggered by an accelerant.[73]

In 1997 the United States Fire Administration performed a series of burn tests and published its findings.[74] In one test, the researchers allowed a compartment fire to flashover for several minutes before extinguishing the blaze.[75] The report noted that after flashover the fire spread and caused damage to the floor under the bed.[76] Thus, collapsed springs are not necessarily an indicator of arson.

The Federal Bureau of Investigation ("FBI") lab in Quantico, Virginia also tested whether collapsed springs were a reliable indicator of flame exposure.[77] The FBI concluded that although liquid accelerants can cause spring collapse, factors such as exposure time, load on the spring, and cooling history

68. NAT'L FIRE PROT. ASS'N, *supra* note 31, at 921–27.

69. *See* JOHN J. LENTINI, SCIENTIFIC PROTOCOLS FOR FIRE INVESTIGATION 455–56 (2006) [hereinafter Lentini, *Scientific Protocols*].

70. *Id.*

71. *See, e.g.,* FED. EMERGENCY MGMT. ADMIN., UNITED STATES FIRE ADMINISTRATION, REPORT OF THE UNITED STATES FIRE ADMINISTRATION PROGRAM FOR THE STUDY OF FIRE PATTERNS 178 (1997) (depicting collapsed springs).

72. John J. Lentini, *A Calculated Arson*, FIRE & ARSON INVESTIGATOR, Apr. 1999, at 20, 23 [hereinafter Lentini, *A Calculated Arson*].

73. *Id.* at 23–24.

74. *See generally* FED. EMERGENCY MGMT. ADMIN., *supra* note 71.

75. *Id.* at 1.

76. *Id.* at 39, 178–79.

77. William A. Tobin & Keith L. Monson, *Collapsed Spring Observations in Arson Investigations: A Critical Metallurgical Evaluation*, 25 FIRE TECH. 317, 328–29 (1989).

all affect whether springs collapse.[78] Further, it concluded that "the 'collapsed' state of coiled furniture/bedding springs is not a reliable indicator" of either smoldering or flaming exposure.[79]

5. Other Burn Patterns

Fire investigators used to interpret several types of burn patterns to suggest the use of accelerants.

> In the past, if the burns on a wall reached down to the floor level or got under a door, furniture, or baseboard, or caused a pool-shaped or irregular-shaped burn pattern on the floor, or a hole in the carpeting or floor, they were considered to be indicative of the presence of a flammable liquid.[80]

One of the first editions of the NFPA 921 stated that the effects of flashover in a compartment fire, along with several other naturally occurring phenomena, can cause the same burning results as would a liquid accelerant.[81] Controlled burn experiments have shown that burn patterns in the shape of spilled liquids can be the result of postflashover burning near the floor level, burning of melted foam plastic materials, or cluttering on the floor, allowing exposed areas to selectively burn.[82]

6. Damage to Metals and Coppers

One misplaced theory among fire investigators is "that accelerants burn at higher temperatures than ordinary combustibles."[83] Thus, fire investigators would conclude the presence of arson if copper and steel were damaged in a structure.[84] This conclusion was proven incorrect in 1991, when fire investigators examined thousands of homes that burned in the hills of Oakland, California.[85] The Oakland fire was not a result of arson.[86] Yet, in that fire, melted copper was present in approxi-

78. *Id.* at 332.

79. *Id.*

80. *See* Pisani, *supra* note 4, at 8–9.

81. NAT'L FIRE PROT. ASS'N, *supra* note 31, at 921-33.

82. John J. Lentini, *The Lime Street Fire: Another Perspective*, FIRE & ARSON INVESTIGATOR, Sept. 1992 at 52, 53–54 (1992).

83. John J. Lentini, *Indicators of Trouble*, http://www.firescientist.com/Publications_files/IndicatorsOfTrouble.pdf (last visited Oct. 10, 2008).

84. *See id.*

85. *See* John J. Lentini et al., *Unconventional Wisdom: The Lessons of Oakland*, FIRE & ARSON INVESTIGATOR, June 1993 at 18, 18–19 (1992).

86. *Id.* at 18.

mately eighty percent of the homes, and melted steel appeared in over ninety percent of the homes.[87]

7. Accelerated Versus Non-Accelerated Fires

A real difference between accelerated and non-accelerated fires is a difference in heat release rate, not in flame temperature. Heat release rate is the amount of energy released per unit of time. Laboratory testing has shown that "[w]ood and gasoline burn at essentially the same flame temperature. The . . . flame temperatures of all hydrocarbon fuels (plastics and ignitable liquids) and cellulosic fuels are approximately the same, although the fuels release heat at different rates."[88]

Ultimately, suspected burn patterns need to be verified by laboratory analysis. Portions of fire debris should be analyzed and tested for traces of accelerants; fire investigators should not rely solely on visual cues of burn patterns.

D. POSITIVE SIGNS OF ARSON

This section of the article briefly covers some of the positive indicators for arson. "The determination of the cause of a fire requires the identification of those materials, circumstances, and factors that were necessary for the fire to have occurred."[89] These include the device, appliance, or equipment involved in the start of the fire, the presence of an ignition source, and the type of material first ignited.[90]

The presence of a single indicator is rarely, if ever, enough to conclude that a fire was set deliberately.[91] Rather, the presence of these indicators may recommend further investigation.[92] One such indicator is multiple fires, defined as "two or more separate, non-related, simultaneously burning fires."[93] Yet fire investigators should be cautious about inferring too much from multiple fire sources because "[a]pparent multiple points of origin can also result from continued burning at remote parts of a building during fire suppression and overhaul."[94]

87. *See id.* at 19.
88. NAT'L FIRE PROT. ASS'N, *supra* note 31, at 921–37.
89. *Id.* at 921–137.
90. *Id.*
91. *Id.* at 921–165.
92. *Id.*
93. *Id.*
94. *Id.*

Another indicator is the presence of "trailers." A trailer may be present when a fuel has been purposely spread from areas throughout the room or house, leaving behind an elongated burn pattern.[95] Samples of the possible accelerants that left the trailers should be taken and analyzed.

The presence of one or more ignitable liquids, or "liquid accelerants," also indicates arson.[96] Yet presence alone is less meaningful if taken out of context. For instance, "[c]ontainers of ignitable liquids in an automobile garage may not be unusual, but a container of ignitable liquids found in a bedroom may be unusual."[97]

"[P]roper analysis of fire patterns by an investigator depends on an understanding of fire development and heat and flame spread."[98] As described above, when full room involvement occurs, "patterns similar in appearance to ignitable liquid burn patterns can be produced when no ignitable liquid is present."[99] However, when overall fire damage is limited, some patterns are more indicative of the presence of accelerants than others. For instance, the presence of small or isolated, irregular burn patterns, or doughnut-shaped patterns, or "U"-shaped patterns in certain areas of the structure, may indicate that a liquid accelerant was used.[100] Rather than relying on visual patterns, investigators should always take samples from any area where liquid accelerants might be present and subject them to laboratory analyses.

Less scientific indicators are also helpful to determine whether a fire was intentionally set. These indicators include whether fire protection systems were sabotaged, whether valuables were removed from the structure immediately before the fire, whether exterior windows and doors were left open, whether there is a motive to start the fire, the geographic location of the fire compared to other arson fires, and the temporal frequency of other possible incendiary fires.

Determining whether a fire was set purposefully requires thorough investigation, laboratory testing of possible accelerants and samples, and a close visual examination of the struc-

95. *Id.*
96. *Id.* 921–166.
97. *Id.*
98. *Id.* at 921–30.
99. *Id.* at 921–45.
100. *Id.* at 921–47.

ture after the fire. Because no single factor is recognized as supporting a conclusion of arson, investigators must evaluate the totality of the evidence and the context within which any physical evidence was found.

II. INNOCENCE IN ARSON CASES

A. NUMBER OF ARSONS AND ESTIMATES OF INNOCENTS

Assuming that many techniques and tools fire investigators rely on to determine incendiary fires are based on an outdated understanding of the relevant science, it is possible that innocent people are convicted for arson based primarily on evidence grounded in misunderstood science. This assertion is especially true for individuals convicted of arson prior to the 1970s, when none of the new scientific advancements in understanding fires had been made. Analyzing the number of arsons each year may provide a rough sense of how many innocent individuals could be in prison for arson.

There were approximately 32,500 structural fires labeled suspicious or incendiary in 2007 in the United States,[101] killing 295 people and causing an estimated $733 million in property damage.[102] In 2007 roughly 15,242 fire investigations resulted in arrests.[103]

It is difficult to estimate how many arsons result in the conviction of innocent persons. However, one fire expert, John Lentini, who has written about and researched extensively trends in fire science and investigations, believes the older science contributed to the conviction of many defendants. As one of the nation's most established and reputable fire investigators, Lentini has conducted over 2,500 fire origin and cause investigations in his thirty-plus year career.[104] He consults for both defense and prosecution attorneys in cases in which a de-

101. MICHAEL J. KARTER, JR., NAT'L FIRE PROTECTION ASS'N, FIRE LOSS IN THE UNITED STATES 2007, at 14 (2008), http://www.nfpa.org/assets/files/PDF/OS.fireloss.pdf.

102. *Id.* at 15 (noting that the property damage figure "includes overall direct property loss to contents, structure, a vehicle, machinery, vegetation, or anything else involved in a fire. It does not include indirect losses, e.g., business interruption or temporary shelter costs").

103. FBI, Crime in the United States 2007: Table 29 Number of Arrests, http://www.fbi.gov/ucr/cius2007/data/table_29.html (last visited Nov. 26, 2008).

104. John J. Lentini, Resume of John J. Lentini, http://www.atslab.com/PDFs/Resume_JohnLentini.pdf (last visited on Oct. 10, 2008).

fendant challenges his or her basis for an arson conviction.[105] He has testified in over 200 cases, authored over 3,000 technical reports, and published eleven peer-reviewed articles on fire investigations.[106] Lentini has helped lead the charge to overhaul the field of fire investigation by lecturing around the country about myths in arson investigations.[107] Over his career, his testimony led to a dismissal or acquittal in twenty-five cases because he convinced the judge or jury that the scientific evidence leading to the conclusion that a fire was of an incendiary origin was flawed.[108] Lentini estimates that currently 100 to 200 people are in prison serving long sentences, or even facing the death penalty, for setting fires that were actually accidents.[109] Gerald Hurst, a chemist with a doctorate from Cambridge University, also believes that many innocent people have likely been convicted over the past fifty years—likely based on the expert testimony finding, erroneously, that the fire was arson.[110] "You've got tons of holdouts—good old boys who've investigated 5,000 fires and they are doing it the same way they've always done it."[111] Some examples of such highly publicized incidents are discussed below.

B. EXAMPLES OF POOR FIRE INVESTIGATIONS

This section of the article describes a few cases in which fire investigators testified in criminal cases and relied on scientific methods that have now been discredited. These cases represent some of the most common errors fire investigators have made, and the influence these experts have on the outcome of the trial.

105. *Id.*

106. *Id.*

107. *Id.*

108. John J. Lentini, Capital Cases: Third Seminar Series, Illinois Supreme Court Comm. on Capital Cases, Distinguishing Fact from Fantasy in Arson Investigations (Sep. 8, 2005).

109. Email from John J. Lentini, Manager, Fire Investigation Division of Applied Technical Services, Inc., to Marc Price Wolf, Law Clerk for Judge Claudia Wilken, United States District Court, Northern District of California. (Feb. 14, 2007) [hereinafter Lentini, *Email*] (on file with author).

110. Maurice Possley, *Arson Myths Fuel Errors: Debunked Theories Plague Fire Probes, Lead to Wrongful Arrests, Prosecutions*, CHI. TRIB., Oct. 18, 2004,§ 1, at 1, 10.

111. *Id.*

1. Beverly Jean Long

On January 23, 2003, Beverly Jean Long watched her husband, James, burn to death trying to thaw out frozen water pipes.[112] That night happened to be the coldest of the year in Georgia. James was using a special heater, called a smudge pot, to warm the frozen pipes, but he filled the heater with gasoline instead of kerosene.[113] This simple mistake cost James his life when the gasoline vapors ignited, burning James to death.[114]

Prosecutors and investigators approached this case as anything but an accident. The chief investigator for the Butts County sheriff's office, Michael Overbey, suspected that Long clubbed her husband and then set him on fire.[115] Overbey investigated as many as two dozen arson-homicides in his thirty years in law enforcement and he was convinced that this was an arson crime scene.[116] He testified that the cracked concrete directly underneath the victim's body had the "characteristics of a spaulding [sic] pattern associated with an arson-homicide."[117] After Long's body was removed, an outline remained on the ground, which Overbey stated was "a pattern that's typically associated with that of a flammable liquid . . . what we refer to as pour patterns."[118] He concluded that the body burned so badly that it must have been doused with a flammable liquid because bodies otherwise would not burn as quickly as Long's did.[119]

The victim's insurance company requested a fire investigator test remnants from the fire scene and testify to his conclusions.[120] The investigator tested the smudge spot and was the first one to discover the presence of gasoline, rather than kerosene.[121] He noted that the exhaust stack of the pot was lined with soot and charcoal flakes, which would remain hot and refuel the fire so as to continually burn Long's body.[122] The in-

112. *Id.*
113. *Id.*
114. *Id.*
115. *Id.*
116. *Id.* at 11.
117. *Id.*
118. *Id.*
119. *Id.*
120. *Id.*
121. *Id.*
122. *Id.*

surance company's fire investigator further testified that there were no pour patterns present at the fire scene.[123] Rather, the patterns Overbey attributed to gasoline pours "were actually the result of 'heat shielding,' a phenomenon caused by such items as clothes, tools, or even a body."[124]

When introduced at trial, the jury believed the fire investigator's testimony over Overbey's and acquitted Long of the arson charge.[125] Not all defendants in arson cases are so lucky. What happens when defense counsel does not have the resources to hire a good fire investigator? Or worse, what if someone was convicted for arson and the only evidence presented in that case about the fire was grounded in outdated and incorrect fire science knowledge?

2. Cameron Todd Willingham

On February 17, 2004, Cameron Todd Willingham was executed by lethal injection.[126] Willingham was convicted of murdering his three children in a house fire.[127] During the trial, fire investigators testified that an accelerant was used to set three separate fires inside the wood-frame, one-story home. The investigators concluded that over twenty indicators of arson pointed them in this direction.[128]

The prosecution's lead expert witness was Manuel Vasquez, the Deputy State Fire Marshal. Vasquez confidently testified that "the fire tells a story" and that "the fire does not lie. It tells me the truth."[129] Vasquez concluded that the fire in this case was arson, just as were *most all* of the 1200 to 1500 other fires that he investigated in his career.[130] The remainder of Vazquez's testimony includes several inaccuracies. For instance he described the floor of the home as having several "pour patterns," which indicated "that somebody poured" a fire accelerant throughout the home.[131] As described previously,

123. *Id.*
124. *Id.*
125. *Id.*
126. Steve Mills & Maurice Possley, *Texas Man Executed on Disproved Forensics: Fire That Killed His 3 Children Could Have Been Accidental*, CHI. TRIB., Dec. 9, 2004, §1, at 1.
127. *Id.*
128. *Id.* at 28–29.
129. *Id.* at 29.
130. Mills & Possley, *supra* note 126, at 29.
131. INNOCENCE PROJECT ARSON REVIEW, supra note 67 at 7–8.

these same "pour patterns" can also be present after a fire reaches a flashover point, which is when the temperature of a closed compartment reaches about 1100-1200 °F.[132] Once a room experiences a flashover it can leave patterns on the floor that look like pour patterns.[133] In this case, the patterns should not have been used to determine an arson fire. Vazquez was not challenged on cross-examination.

Improperly interpreting pour patterns was not Vazquez's only mistake in this trial. He incorrectly concluded that the fire was arson because it burned "hotter . . . than normal,"[134] because bed springs melted, and because there were "multiple areas of origin . . . [without a] connecting path, [which indicated] that they were intentionally set by human hands."[135] In fact, each of the arson indicators about which Vazquez testified relates as well to arson as to a fire that has achieved full room involvement and experienced a flashover, as this fire did.[136]

3. Han Tak Lee

In 1989 Han Tak Lee was convicted of killing his daughter in an intentionally set fire of their log cabin.[137] Lee's attorney did not even challenge the prosecution's arguments that the fire was incendiary, nor did he hire any expert witnesses of his own.[138] Rather, Lee's attorney argued that the daughter burned herself in a suicide.[139] The fire investigator in this case made conclusion after conclusion based on possibly inaccurate science. The lack of a knowledgeable fire investigator present to rebut any of these claims likely disadvantaged Lee in the eyes of the jury.

Before the trial, a Certified Fire Protection Specialist, Dan Aston, wrote a report on his finding of the fire scene, which became the basis for the arson claim.[140] Even though Aston was just a part-time investigator who had a day job designing sprinkler systems, Aston testified that he had examined about 15,000 fires in his career.[141] This number is very likely inaccu-

132. *Id.* at 8–9.
133. *Id.*
134. *Id.* at 10.
135. *Id.*
136. *Id.* at 13.
137. *Id. at* 10.
138. *See* Lentini, *A Calculated Arson*, *supra* note 72, at 25.
139. *Id.*
140. *Id.* at 21.
141. *Id.* at 24.

rate because even the busiest full-time fire investigators can only investigate about 5000 fires in a career.[142] Although Aston was certified, his conclusions reflected an outdated understanding of fire investigations.

Aston's first mistake was comparing the temperatures of the fire against the American Society of Testing and Materials ("ASTM") time/temperature curve, which should never have been used in this context. The time/temperature curve was developed in 1918 to describe the operation of furnace fires.[143] Aston used the curve to conclude that "any deviation" of the temperature of the fire at Lee's cabin "would be evidence of an excessive fuel load."[144] "Numerous experiments on real fires [have proved] that the ASTM time/temperature curve has no relationship to reality."[145]

Using the ASTM curve, Aston concluded that in order for the fire to burn as hot as it did, there had to have been about three gallons of gasoline and home heating fuel per square foot of area in the cabin at the time of the fire.[146] This means that the cabin would have been sitting in gasoline up to twelve centimeters deep in some areas.[147] It should not take an arson investigator to realize that saturating a cabin in that much gasoline is highly improbable, if not impossible, for one person to accomplish. Further, no traces of fuel oil were found in Lee's clothes after the incident.[148] It would be difficult or almost impossible for Lee to escape such a fuel-laden fire unharmed, let alone without any traces of the fuels that Aston stated were present at the fire.

Another fire investigator, Trooper Thomas Jones, testified at trial that the presence of crazed glass "indicate[d] that the glass was close to . . . a point of origin" of the fire.[149] As mentioned in Part I of this article, crazing of glass does not yield any useful information about fires, and it can be caused by the rapid cooling of glass, not just the rapid heating of it. Jones also testified that collapsed springs in furniture, low burning at

142. *Id.*
143. *Id.* at 21.
144. *Id.*
145. *Id.*
146. *Id.* at 22.
147. *Id.*
148. *Id.* at 23–24.
149. *Id.*

doorways, and holes found in the floor were evidence of a liquid accelerant introduced on the floor, to allow the fire to burn so low.[150] Trooper Jones did not believe that these burn indicators could be the result of a flashover effect.[151]

Lee's case "[r]epresents the ultimate triumph of junk science."[152] The first edition of the NFPA 921 had not been published at the time this case went to trial. Though some scientists and fire investigators around the country knew enough about fires to counter Aston's and Jones' conclusions, the state of fire investigation knowledge was in flux at the time of Lee's trial. Arguably, back then, not many defense attorneys even knew that the scientific bases for fire investigators' conclusions could be incorrect. Now, defense attorneys in arson cases should know enough about the state of fire investigations to realize that they need to independently investigate all fires, and not blindly accept the fire investigator's conclusions.

III. LEGAL CHALLENGES

This part of the article discusses some legal remedies available to innocent people convicted of arson where bad science was involved. The legal tools that a prisoner can use to challenge a conviction vary tremendously depending on the lifecycle of a case. This paper focuses on federal habeas corpus claims because this is the most likely legal tool available to individuals whose trials involved possibly now-discredited evidence of arson that may have influenced a jury. Since the science of fire investigation took great strides in the early 1990s, there is a good chance that arson convictions any time before or during the early 1990s involved evidence, opinions, or expert testimony that today would not be credited. But, since many years have passed, it is also likely that these individuals have already exhausted their direct appeals and state habeas corpus challenges.[153] Thus, the only legal remedy available for many in this group of people would be a federal habeas petition.[154]

150. *Id.*

151. *Id.*

152. *Id.* at 25.

153. *See generally* 28 U.S.C. §§ 2254(b)–(c) (2000) (requiring prisoners to exhaust state judicial opportunities to litigate federal claims before presenting those claims to a federal court in a petition for a writ of habeas corpus); Medwed, *supra* note 3, at 675-86 (describing the many procedural and temporal state requirements to challenge convictions that prisoners with new DNA evidence must address in their legal challenges).

154. *See* Medwed, *supra* note 3, at 675–86 (noting that states vary the

The remainder of this article discusses the general legal remedies available through the writ of federal habeas corpus, whether the statute allows for challenges that would arise from convictions based on debunked science, and how successful such challenges have been.

A. BRIEF OVERVIEW OF HABEAS CORPUS

The origins of the writ of habeas corpus can be traced back to medieval English law. The phrase "habeas corpus" is Latin and means "you have the body."[155] In a legal context, this phrase refers to the original usage of habeas, which was to challenge the disappearance of individuals in official custody.[156] The framers of the Constitution recognized the importance of the writ by including it in the text of the Constitution, "The Privilege of the Writ of Habeas Corpus shall not be suspended, unless when in Cases of Rebellion or Invasion the public Safety may require it."[157] The Judiciary Act of 1789, passed during the first session of Congress, created lower federal courts and defined the jurisdiction of the federal judiciary, and also ensured that habeas corpus was available to prisoners for "the purpose of an inquiry into the cause of commitment."[158] However, the Judiciary Act only provided federal courts the authority to grant habeas to federal prisoners.[159] After the Civil War, the Reconstruction Act allowed federal courts to grant habeas corpus to state prisoners out of the fear that southern states might persecute or imprison former slaves.[160] Even after this expansion, the use of the writ was limited to challenging whether the sentencing court lacked jurisdiction to sentence an individual.[161]

Habeas Corpus did not become available to a broader

statute of limitations that prisoners can directly appeal their conviction from a few weeks to a few years, and state habeas claims have similarly varied statute of limitations).

155. LARRY W. YACKLE, FEDERAL COURTS: HABEAS CORPUS 1 (2003).

156. *Id.*

157. U.S. CONST. art. I, § 9, cl. 2.

158. Judiciary Act of 1789 § 14, ch. 20, 1 Stat. 73, 82.

159. Judiciary Act of 1789 §§ 1–35, at 73–93.

160. *See* Act of Feb. 5, 1867, ch. 28, 14 Stat. 385 (codified as 28 U.S.C §§ 2241-2255); Max Rosenn, *The Great Writ—A Reflection of Societal Change*, 44 OHIO ST. L.J. 337, 342 (1983).

161. CHARLES H. WHITEBREAD & CHRISTOPHER SLOBOGIN, CRIMINAL PROCEDURE: AN ANALYSIS OF CASES AND CONCEPTS 904 (3d ed. 1993).

swath of prisoners until after World War II, when Chief Justice Warren led the Supreme Court. With Warren as Chief Justice, the Supreme Court decided a case that allowed habeas corpus petitioners to relitigate all constitutional claims in federal court.[162] The Warren Court also decided an important case that held that an individual would only be barred from raising matters not litigated in state court if it could be shown that the individual deliberately bypassed state procedures.[163]

Since the Warren Court, later Supreme Court cases have narrowed the scope of habeas corpus relief.[164] The most recent shift in habeas law occurred when Congress passed the Antiterrorism and Effective Death Penalty Act of 1996 ("AEDPA"). AEDPA created many restrictions on the availability of habeas relief. New statute of limitations provisions were added,[165] a higher threshold to file successive habeas petitions was created,[166] and the issues available for review were limited.[167]

Under current law, to secure habeas corpus relief, a person must exhaust all available state remedies.[168] However, state

162. *See* Brown v. Allen, 344 U.S. 443 (1953) (holding all constitutional claims can be relitigated on habeas corpus).

163. *See* Fay v. Noia, 372 U.S. 391 (1963) (arguing that claims not raised in state courts may be raised on habeas corpus unless the petitioner deliberately bypassed state procedures).

164. *See, e.g.*, McClesky v. Zant, 499 U.S. 467, 494–95 (1991) (to file a second or successive habeas petition, petitioner must show cause as well as actual prejudice or show a fundamental miscarriage of justice); Teague v. Lane, 489 U.S. 288, 309–10 (1989) (habeas petitioners may generally only assert rights that existed as of the time of their conviction); Wainwright v. Sykes, 433 U.S. 72 (1977) (stating that claims not presented in state court may be raised on habeas corpus only if there is cause and prejudice); Stone v. Powell, 428 U.S. 465 (1976) (Fourth Amendment exclusionary rule claims cannot be raised on habeas corpus if the state court provided a full and fair hearing).

165. *See, e.g.*, 28 U.S.C. § 2244 (d)(1) (2000) ("A 1-year period of limitation shall apply to an application for a writ of habeas corpus by a person in custody pursuant to the judgment of a state court.").

166. *See, e.g.*, 28 U.S.C. § 2244 (b)(2)(B) ("[T]he factual predicate for the claim could not have been discovered previously through the exercise of due diligence; and . . . the facts underlying the claim . . . would be sufficient to establish by clear and convincing evidence that . . . no reasonable factfinder would have found the applicant guilty of the underlying offense.").

167. *See, e.g.*, 28 U.S. C. § 2254(d)(1) (relief only available when the state court determination "was contrary to, or involved an unreasonable application of clearly established Federal law, as determined by the Supreme Court of the United States").

168. Section 28 U.S.C. 2254(b):

> (1) An application for a writ of habeas corpus on behalf of a person in custody pursuant to the judgment of a State court shall not be granted unless it appears that—(A) the applicant has exhausted the

prisoners do not have to use state court habeas procedures, as long as the issues have been presented and decided by the state courts on direct appeal.[169] Conversely, a prisoner must exhaust available state court habeas procedures for issues not raised on direct appeal.[170]

The Supreme Court and Congress have also limited the types of issues that can be litigated in federal court habeas corpus proceedings. Generally, habeas petitioners seek redress for violations of the Constitution or laws of the United States. The basic rule handed down by the Supreme Court is that habeas petitions cannot seek to recognize new rules of constitutional law.[171] There are also limits on a habeas petitioner when trying to present issues in a habeas proceeding that were not raised at the time of trial. The basic rule is that these claims are procedurally defaulted unless the habeas petitioner can demonstrate "good cause" for not raising the issue earlier and "prejudice" as a result of the alleged violation of federal law.[172] As an alternative to demonstrating cause, the Supreme Court has held that a habeas petitioner may raise matters not argued in state court by showing that the petitioner is actually innocent.[173]

B. THE FEDERAL HABEAS CORPUS STATUTE, FACT-FINDING, AND NEW EVIDENCE

First, it is important to sort through some of the intricacies of the federal habeas statute to understand which sections, if any, of the complicated federal statute allow for the type of

remedies available in the courts of the State; or (B)(i) there is an absence of available State corrective process; or (ii) circumstances exist that render such process ineffective to protect the rights of the applicant.

169. Brown v. Allen, 344 U.S. 443, 447 (1953) ("It is not necessary . . . for the prisoner to ask the state for collateral relief, based on the same evidence and issues already decided by direct review.").

170. *See*, *e.g.*, Wade v. Mayo, 334 U.S. 672, 677–78 (1948).

171. *See*, *e.g.*, Teague v. Lane, 489 U.S. 288 (1989).

172. Coleman v. Thompson, 501 U.S. 722, 750 (1991):

> We now make it explicit: in all cases in which a state prisoner has defaulted his federal claims in state court pursuant to an independent and adequate state procedural rule, federal habeas review of the claim is barred unless the prisoner can demonstrate cause for the default and actual prejudice as a result of the alleged violation of federal law, or demonstrate that the failure to consider the claim will result in a fundamental miscarriage of justice.

173. *See infra* section III.C. ("Actual Innocence Claims")

challenges that individuals convicted of arson based largely on debunked science would need to bring. Federal challenges are typically filed long after state court proceedings have concluded. As a matter of federalism and comity between state and federal courts, federal courts presume the adequacy of state proceedings and decisions.[174] Specifically, pursuant to 28 U.S.C. § 2254(e)(1), a federal court must presume that a "determination of a factual issue by a State court" is correct. This presumption can only be overcome by "clear and convincing evidence" that the state court reached an erroneous determination.[175]

This statute may cause confusion when read next to 28 U.S.C. § 2254(d)(2), which allows a federal court to award relief on the merits of a case if a previous state court adjudication "resulted in a decision that was based on an unreasonable determination of the facts in light of the evidence presented in the State court proceeding."[176] Even though under § 2254 (e)(1) a federal habeas court can conclude that state findings were erroneous, despite the strong presumption in their favor, the court may still find that those erroneous findings were not unreasonable.[177] This makes sense because courts can make reasonably mistaken conclusions with respect to facts. Thus, a court can both analyze the challenge under § 2254(e)(1), to determine whether any errors were made, and analyze the challenge under § 2254(d)(2) to determine whether those errors were unreasonable.[178]

Yet § 2254(e)(1) is concerned with evidence that was brought in front of the trial court. Prisoners convicted of arson on the basis of science that has now been disproved did not have a chance to present this evidence in front of a trial court because the scientific knowledge did not exist or was not utilized at the time of the trial. Though § 2254(e)(1) does not pro-

174. *See, e.g.*, 28 U.S.C. § 2254(e)(1).

175. 28 U.S.C. § 2254(e)(1).

176. 28 U.S.C. § 2254(d)(2).

177. *See, e.g.*, Woods v. Quarterman, 493 F.3d 580, 586 (5th Cir. 2007) ("[T]he state habeas court's conclusion that Woods failed to demonstrate that he suffered from sub-average general intellectual functioning was not unreasonable."); Whitehead v. Dormire, 340 F.3d 532, 539 (8th Cir. 2003) ("Whitehead has not . . . demonstrated that the state court's determination of facts was unreasonable . . . ."); McClain v. Prunty, 217 F.3d 1209, 1222 (9th Cir. 2000) (concluding that trial court's decision was grounded on an unreasonable conclusion about the facts).

178. *See, e.g., Whitehead*, 340 F.3d at 539 (stating plaintiff failed to meet requirements of either subsection).

vide relief to these prisoners, the Supreme Court has addressed how these prisoners can obtain relief.

The general standard for determining when a federal habeas court can conduct its own evidentiary hearing to determine facts that cannot be ascertained by other means was outlined in *Townsend v. Sain*.[179] There the Court held that a federal court must conduct an evidentiary hearing (a) if a petition alleges facts which, if true, would establish a meritorious claim, (b) if the respondent, in turn, disputes those allegations, and (c) if there was no "full and fair" hearing in state court.[180] Even if a federal habeas court is not required to hold a hearing, the court nevertheless maintains discretionary power to hold one.[181]

Though *Townsend* permits a federal habeas court to entertain these types of evidentiary hearings, a prisoner can be barred from this type of hearing if the prisoner procedurally defaults with respect to fact finding in state court. 28 U.S.C. § 2254(e)(2) states:

> If the applicant has failed to develop the factual basis of a claim in State court proceedings the [federal] court shall not hold an evidentiary hearing on the claim unless the applicant shows that—
>
> (A) the claim relies on—
>
> (i) a new rule of constitutional law, made retroactive to cases on collateral review by the Supreme Court, that was previously unavailable; or
>
> (ii) a factual predicate that could not have been previously discovered through the exercise of due diligence; and
>
> (B) the facts underlying the claim would be sufficient to establish by clear and convincing evidence that but for constitutional error, no reasonable factfinder would have found the applicant guilty of the underlying offense.[182]

In order to proceed with an evidentiary hearing under this statute, a federal habeas court must first determine whether the prisoner is responsible for his or her own inadequate fact-finding in a state court: prisoners who failed to exercise diligence in pursuing facts underlying a claim when they had an opportunity to do so in state court.[183] In most cases, diligence, at minimum, requires a request for a state court evidentiary

179. 372 U.S. 293 (1963).
180. *Id.* at 312–13.
181. *Id.* at 318.
182. 28 U.S.C. § 2254(e)(2).
183. Williams v. Taylor, 529 U.S. 420, 437–40 (2000).

hearing.[184]

The Court realizes that § 2254(e)(2)(A)(ii) addresses cases in which the facts "could not have been discovered."[185] In other words, in *Williams v. Taylor*, the Supreme Court openly acknowledged that a habeas court can hold an evidentiary hearing if the evidence in question "did not exist" to be discovered, irrespective of the diligence that a prisoner exerted.[186] Therefore, the court has interpreted § 2254(e)(2)(A)(ii) to endorse the introduction of entirely new facts that came into existence only after state court proceedings were completed.

1. The Application of 24 U.S.C. § 2254(e)(2)(A)(ii) to New Scientific Knowledge

Though the Supreme Court squarely endorses a habeas evidentiary hearing for the introduction of new materials that come into existence after a state trial, the Court has not directly addressed the issue of whether new scientific knowledge that comes into existence after a state trial would also fall under § 2254(e)(2)(A)(ii). While the Supreme Court has not spoken to this issue, there is no principled reason why new knowledge of a science should be treated any differently than new material evidence.

The new scientific framework for understanding fires should be treated the same as newly discovered DNA evidence. This type of DNA evidence is regularly treated as newly discovered evidence.[187] In a case in which a prisoner challenges a conviction based on DNA, the prisoner uses scientific advancements to test a material to see if DNA existed at the crime scene that would exonerate the prisoner. In arson cases, no new evidence is necessarily tested, but many of the scientific foundations for the conclusions scientists made to help convict an individual have been completely undermined.

In an arson case, new science invalidates old scientific conclusions, instead of testing old materials for DNA. Theoretically, courts should interpret the federal habeas statute to treat

184. *Id.* at 437.

185. *Id.* at 435.

186. *Id.* at 435–36.

187. *See* Barry Scheck & Peter Neufeld, *DNA and Innocence Scholarship*, *in* WRONGLY CONVICTED: PERSPECTIVES ON FAILED JUSTICE 241, 244 (Sandra D. Westervelt & John A. Humphrey eds., 2001) ("[E]ven when an inmate seeks access to the evidence to perform a DNA test . . . the state courts have repeatedly deemed the access motions to be newly discovered evidence applications . . . .").

these two situations similarly, although they are not perfectly analogous. In one instance a fire investigator might have concluded that concrete spalling and holes in the ground were conclusive evidence of arson, when in reality, this conclusion has been proved false by a better understanding of fire science; similarly, a forensic scientist might have concluded that the blood type of the victim and the suspect matched, when in reality this conclusion has been proved false by a DNA test which found the two samples to be a non-match.

A counter-argument is that this "evidence is not newly discovered evidence, but [merely] newly available." as a result of technological advances.[188] Because it existed in some form at the time of the trial, it is not in fact newly discovered. However, when parties attempt to introduce DNA evidence as newly discovered evidence, courts do not respond by denying the request because the blood or other human particle evidence existed at the time of the trial. Rather, courts understand that the blood or other human particle evidence takes on an entirely new meaning once analyzed for DNA. Even though the presence of the material evidence has not changed since the advent of DNA testing, the court's understanding of the material evidence in relation to a prisoner's conviction might change tremendously after learning the results from a DNA test.

Another counter-argument is that results from DNA testing and results from a new analysis of a fire crime scene based on reliable scientific methods are not analogous. A DNA match is performed according to specific scientific methods and then an expert scientist testifies about the statistical probability that the two samples are the same. In contrast, some might argue that even with the new advancements in arson investigation, juries would still have to rely on an arson investigator's opinion about the cause of a fire. And relying on an expert arson investigator's opinion is not the same as relying on statistical interpretations of DNA evidence. Why should an expert's *opinion* be treated as a new "*factual* predicate that could not have been previously discovered through the exercise of due diligence?"[189] Opinions should not be treated as facts. This is a fair criticism, to a certain extent.

In many instances, the results from DNA tests can prove

188. Penny J. White, *Newly Available, Not Newly Discovered*, 2 J. APP. PRAC. & PROCESS 7, 11 (2000).

189. Section 2254(e)(2)(A)(ii) (emphasis added).

matches between human particle samples to an almost certainty.[190] It is not clear that an expert will ever be able to know how each fire started and progressed with this same certainty. However, many of the advancements in the understanding of fire science have developed to the point where the indicators used previously to identify arsons are, simply, incorrect and unreliable. If that indicator was relied on to help win a conviction, and there is no way that the presence of that indicator supports the conclusion that a fire was of incendiary origin, then the conviction itself is called into question. In this manner, the analogy between the advancements in understanding fires and the advancements in understanding the identification of humans through DNA is a useful one.

Here is another way of understanding this analogy within the legal framework of § 2254(e)(2)(A)(ii); The factual predicate underlying the claim that DNA evidence might call into question the validity of evidence used in a conviction is that scientific advancements have allowed for new types of highly reliable testing of human particles. The factual predicate underlying the claim that a different interpretation about the material evidence at a fire crime scene might call into question the validity of a conviction is that scientific advancements have allowed for a more reliable and accurate understanding of how fires start. The scientific advancements themselves create new factual predicates that fit within the § 2254(e)(2)(A)(ii) framework. Therefore, in instances where arson convictions were based entirely on now discredited science, courts should read the habeas statute to allow for the introduction of this type of new scientific knowledge.

Some may fear that reading the statute in this manner will drastically increase the number of habeas petitions in federal courts. This fear is likely unfounded because new science in the arson scenario, unlike DNA, will rarely automatically exonerate the defendant. The new scientific understanding of fire does not undermine a case factually in the same way as DNA evidence does. For instance, DNA evidence can exonerate an individual when the evidence shows that the individual was not present at the scene of the crime or linked to the crime in any way. In the arson example, even with the new understanding of fire science, it is not as clear that scientists can say with the same certitude that the fire was not the result of arson, or that

190. Harvey v. Horan, 285 F.3d 298, 305 n.1 (4th Cir. 2002) (Luttig, J., respecting the denial of rehearing en banc),

the individual was not linked to the crime. The more likely reinterpretation of the old fire evidence will call into doubt the old conclusions, not necessarily exonerate the individual convicted of arson.

B. SUCCESSIVE PETITIONS

A natural question arises as to whether prisoners can file a second or successive habeas petition that challenges their arson convictions. As a matter of fairness, prisoners should be able to challenge their convictions based on a new scientific understanding of fires if that new understanding would completely undermine their conviction. Yet, the Supreme Court has limited a prisoner's ability to file second or successive habeas petitions in recent cases.

Most attorneys familiar with appellate decisions in criminal procedure know that repetitious habeas applications are largely a feature of *pro se* litigation.[191] Many prisoners are acting on their own, without the help of an attorney, when they file first petitions, but are fortunate enough to obtain counsel to help them file later petitions. Congress has limited a prisoner's ability to have more than one bite at the habeas apple.[192] The new standards set forth by Congress impose demanding requirements for second or successive federal petitions.[193] Therefore, the likelihood of success for multiple filings is very rare.

A claim raised for the first time in a second or successive habeas petition may be considered only if it meets the exacting standards listed in § 2244(b)(2)(B). The statute requires that the "applicant shows" that

> (i) the factual predicate for the claim could not have been discovered previously through the exercise of due diligence; and (ii) the facts underlying the claim, if proven and viewed in light of the evidence as a whole, would be sufficient to establish by clear and convincing evidence that, but for constitutional error, no reasonable factfinder would have found the applicant guilty of the underlying offense.[194]

One aspect of the successive petition statute, § 2244(b)(2), appears more demanding than its first petition analogue in § 2254(e)(2). Paragraph (B)(ii) of § 2244(b)(2) requires federal

191. YACKLE, *supra* note 155, at 56–57.

192. *See generally* Antiterrorism and Effective Death Penalty Act of 1996, Pub. L. No. 104-132, 110 Stat. 1214 (codified as amended in scattered sections of 28 U.S.C., 21 U.S.C., 18 U.S.C. & 42 U.S.C.) (1996).

193. *See* YACKLE, *supra* note 155, at 254.

194. 28 U.S.C. § 2244(b)(2)(B).

habeas courts to view new factual allegations "in light of evidence as a whole."[195] The phrase "as a whole" presumably includes the evidence presented at trial. Section 2254(e)(2) does not require the court to consider any evidence originally presented at trial when deciding whether to grant a federal evidentiary hearing.[196]

This added requirement creates a more demanding test for successive petitions. Though Congress intended to reduce the number of successive petitions, this statutory requirement also might eliminate habeas as a remedy for many otherwise eligible prisoners. It is not clear if this added requirement is severe enough to close the courts' doors to prisoners' habeas claims based on discredited science.

On one hand, if a court only looks at how the new scientific understanding of arson applies to a particular conviction, a prisoner is arguably more likely to be granted an evidentiary hearing on this narrow issue. Yet, if a court looks at this new science and compares it to the entirety of the evidence presented in the trial, a court may be less likely to grant an evidentiary hearing in the first place. Courts should grant the evidentiary hearing, analyze the new evidence in that hearing, and then compare the new evidence against the evidence as a whole. This approach would allow the court to view the factual and legal issues from a more complete perspective. As the statute stands now, many innocent prisoners might not be able to present their habeas petition because of the demanding requirement in § 2244(b)(2).

C. ACTUAL INNOCENCE CLAIMS

Even though it is generally the function of state trial courts and juries to determine whether defendants actually committed the criminal acts that they are charged with, federal habeas courts have created a safety valve to address claims of actual innocence. In the 1986 decision *Murray v. Carrier*, the Supreme Court noted that, "in an extraordinary case, where a constitutional violation has probably resulted in the conviction of one who is actually innocent," a federal court can address the merits of a claim.[197]

195. § 2244(b)(2)(B)(ii).

196. § 2254(e)(2).

197. Murray v. Carrier, 477 U.S. 478, 496 (1986) (also noting that a prisoner can advance this claim "even in the absence of a showing of cause for the procedural default").

While an actual innocence avenue to a habeas court exists, it remains a narrow avenue of relief. In *Schlup v. Delo* the Court held that a prisoner must satisfy the probable innocence standard with "new reliable evidence—whether it be exculpatory scientific evidence, trustworthy eyewitness accounts, or critical physical evidence—that was not presented at trial."[198] A court must then decide whether on the basis of that evidence, "it is more likely than not that no reasonable juror would have convicted him in the light of the new evidence."[199]

"[T]he existence merely of newly discovered evidence relevant to the guilt of a state prisoner is not a ground for relief on federal habeas corpus."[200] A prisoner must allege an independent constitutional violation in the state proceeding in order to be granted habeas relief.[201] In *Herrera v. Collins* the Supreme Court clearly stated that a "claim of 'actual innocence' is not itself a constitutional claim, but instead a gateway through which a habeas petitioner must pass to have his otherwise barred constitutional claim considered on the merits."[202] Later in the opinion, the Court noted that "a truly persuasive demonstration of 'actual innocence'" would demand a different result.[203] In a concurring opinion, Justice White similarly noted "that a persuasive showing of 'actual innocence' made after trial, even though made after the expiration of the time provided by law for the presentation of newly discovered evidence, would render unconstitutional the execution of petitioner in this case."[204]

Recently, in *House v. Bell*, the Supreme Court was poised to address whether the gateway of an innocence claim in a habeas petition could also be sufficient as a free-standing innocence claim.[205] House was convicted of murder by a jury, and he

198. Schlup v. Delo, 513 U.S. 298, 324 (1995).

199. *Id.* at 327.

200. Herrera v. Collins, 506 U.S. 390, 398 (1993) (quoting Townsend v. Sain, 372 U.S. 293, 317 (1963)).

201. *Id.* at 400.

202. *Id.* at 404.

203. *Id.* at 417 ("We may assume, for the sake of argument in deciding this case, that in a capital case a truly persuasive demonstration of 'actual innocence' made after trial would render the execution of a defendant unconstitutional . . . .").

204. *Id.* at 429 (White, J., concurring).

205. *See* House v. Bell, 547 U.S. 518, 522 (2006).

had procedurally defaulted his state habeas claims.[206] In his first federal habeas petition, he presented a variety of new evidence, including DNA evidence proving that semen, which was attributed to him in the trial, actually belonged to someone else.[207]

Justice Kennedy, writing for a majority of the Court, held that this was one of those rare instances where House satisfied the "stringent showing" required under the *Schlup* standard.[208] House convinced five justices that in light of the new evidence "it is more likely than not that no reasonable juror would have found petitioner guilty beyond a reasonable doubt."[209] Therefore, despite the state procedural bars placed in front of House, he was allowed to proceed in federal court with his habeas petition.[210] Yet, under the *Schlup* standard, the habeas court's analysis must consider "'all the evidence,' old and new, inculpatory and exculpatory, without regard to whether it would necessarily be admitted under 'rules of admissibility that would govern at trial.'"[211]

It is important to note that the Court held inapplicable the AEDPA[212] standards for second or successive petitions (i.e., § 2244(b)(2)(B)(ii)) and the threshold for obtaining an evidentiary hearing on claims not developed in state court (i.e., § 2254(e)(2)). The court held that "[n]either provision addresses the type of petition at issue here—a first federal habeas petition seeking consideration of defaulted claims based on a showing of actual innocence. Thus, the standard of review in these provisions is inapplicable."[213] This statement is important. The Court explicitly refrained from analogizing a gateway innocence claim analysis to that of a petition for an evidentiary hearing or a second or successive petition. Even though these statutes could have provided guidance to the Court, it chose to proceed down a path unguided by the federal statutes.

Even with the newly discovered evidence, Justice Kennedy noted that there was a fair amount of circumstantial evidence against House, stating, "[t]his is not a case of conclusive exon-

206. *Id.*
207. *Id.* at 540.
208. *Id.* at 522.
209. *Id.* at 537 (quoting Schlup v. Delo, 513 U.S. 298, 327 (1995)).
210. *See id.*
211. *Id.* at 538 (quoting *Schlup*, 513 U.S. at 327–28 (1995)).
212. Antiterrorism and Effective Death Penalty Act of 1996.
213. *House*, 547 U.S. at 539.

eration."[214] Therefore, even though House cast doubt on his guilt with the newly discovered DNA evidence, he did not satisfy the *Herrera* threshold for a freestanding innocence claim, if such a claim exists.[215] In the end, Justice Kennedy declined to address the unresolved status of whether House's freestanding innocence claims exist. Yet he noted that if a *Herrera* freestanding innocence claim were to exist, House would have required more convincing proof of innocence than *Schlup* requires. Because House satisfied the *Schlup* standard, the Court did not further delineate what the *Herrera* freestanding innocence threshold would look like.

Though *House* did not articulate a freestanding innocence standard, it can be read to require a high threshold. In order for a prisoner convicted of arson based on junk science to prevail on a freestanding innocence habeas claim, the initial arson conviction would have to be largely based on fire investigators' incorrect scientific conclusions and not other circumstantial evidence. *House* appears to stand for the proposition that as long as a federal court can point to other circumstantial evidence that could establish guilt, irrespective of the overwhelming presence of the jury's reliance on debunked scientific methods, a freestanding innocence claim will likely fail. While this scenario would likely grant a gateway claim to habeas based on innocence under the *Schlup* standard, it probably will not meet the high standard set out in *Herrera*.

It is not clear just how many individuals in prison for arson were convicted largely, if not solely, on the evidence presented by a fire investigator. By one leading arson investigator's estimate, up to 100 to 200 people are in prison for setting fires that were actually accidental. Though arson prosecutions may have complemented scientific evidence with evidence of motive or the absence of an alibi, the scientific evidence is sometimes presented as the nucleus that made this other evidence relevant. For instance, it is not unusual for fire investigators to conclude motive based on scientific evidence. In Cameron Todd Willingham's case described above, the lead investigator testified at trial that because Willingham's alibi did not comport with his own scientific conclusions, Willingham therefore "told [him] a story of pure fabrication."[216] The investigator concluded that

214. *Id.* at 553.

215. *Id.* at 554–55.

216. INNOCENCE PROJECT ARSON REVIEW, *supra* note 67, at 14.

what Willingham "said he had done was inconsistent with the burn patterns in the house,"[217] and "all [Willingham] did was lie."[218] Once the scientific bases for a fire investigator's conclusions are proven false, it may be reasonable to evaluate a fire investigator's conclusions about alibis and motives that were premised on those scientific conclusions. Individuals convicted of arson based on junk science might be good candidates to test the *Herrera* standard.

D. RECENT HABEAS CASES AND ARSON CONVICTIONS

1. Albrecht v. Horn

At the time of this writing, no post-*House* courts have ruled on a freestanding innocence habeas claim stemming from an arson conviction. Yet, one district court in Pennsylvania had occasion to deal with this issue two years before *House*.[219] Despite predating the *House* decision, analyzing this district court's opinion in light of the recent Supreme Court ruling is instructive in predicting how post-*House* courts might approach the issue.

In *Albrecht v. Horn*, Alfred Albrecht challenged his 1980 convictions for arson and the murder of his wife, mother, and daughter.[220] In addition to the testimony of state fire experts, at the trial prosecutors presented evidence that Albrecht physically and emotionally abused his wife in the past, that he abused his wife and threatened to burn the house down the night before the fire, and that he had an empty can of gasoline in his car.[221] One of Albrecht's fourteen arguments in his habeas petition was that "new developments in fire science [proved] his claim of actual innocence."[222]

It is important to note that before delving into the habeas claim, the court held that Albrecht did not violate state procedural rules for challenging his conviction.[223] Thus, the court held that Albrecht was not procedurally barred from bringing this habeas claim.[224] This is an important point of comparison

217. *Id.*
218. *Id.*
219. Albrecht v. Horn, 314 F. Supp. 2d 451 (E.D. Pa. 2004).
220. *Id.* at 457.
221. *Id.* at 456–57.
222. *Id.* at 463.
223. *Id.* at 460.
224. *Id.* at 461.

in the context of *House*, *Herrera*, and *Schlup*. Albrecht was not seeking to use his claim of innocence to overcome defaulted claims and provide a gateway into federal court. Albrecht directly challenged his conviction in the habeas petition based on his innocence.

Even though Albrecht was attempting to present a freestanding innocence habeas claim, the court applied the gateway innocence legal standard in *Schlup*. The court restated the *Schlup* legal standard: "If the petitioner asserts his actual innocence of the underlying crime, he must show 'it is more likely than not that no reasonable juror would have convicted him in light of the new evidence.'"[225] In the same paragraph though, the court appeared to create a higher threshold for freestanding innocence claims: the new evidence presented must "foreclose the possibility of guilt, or at least of a guilty verdict."[226] Evidence that forecloses the possibility of guilt is not the same as evidence that forecloses the possibility of a guilty verdict. In this sentence, the court recognizes that foreclosing the possibility of a guilty verdict is a lesser threshold than foreclosing the possibility of guilt. The former has to do with the reasonableness of a juror's conclusion, while the latter would essentially require the petitioner to prove his innocence. The *Schlup* standard represents the former, whereas the standard alluded to in *House* appears to represent the latter. Even though at the outset the court claims to follow the standard in *Schlup*, the rest of the opinion actually analyzes Albrecht's claim against a stricter *House*-like standard. It is possible that the court used these standards interchangeably because it considered the difference irrelevant to the facts of this case.

One year before this decision, Albrecht successfully obtained an evidentiary hearing in a federal court to present the new fire science evidence.[227] The court was willing to view an expert's testimony that debunked old science as "new evidence." It recognized the importance of granting Albrecht a forum to present the new scientific evidence. The court did not agree with the Commonwealth's arguments that the fire science presented by Albrecht was not new evidence.[228] The Commonwealth argued that at the time of the trial, in 1980, a French

225. *Id.* at 464 (quoting Calderon v. Thompson, 523 U.S. 538, 559 (1998)).
226. *Id.*
227. *Id.*
228. *Id.* at 465 n.9.

text had been published which advised the insurance industry of new scientific advancements in fire science.[229] The court recognized that this book, "could not have been discovered through the exercise of due diligence."[230] It was "not the sort of thing that was available to fire investigators" at the time of the trial.[231] Moreover, the book did not contain scientific proof that the contemporary fire science was wrong. Rather, it suggested that further scientific testing was needed.[232]

After reviewing the newly discovered evidence presented in the evidentiary hearing, the court recognized that Albrecht "convincingly show[ed] that the fire science evidence presented by the Commonwealth at his trial has since been discredited."[233] He presented evidence that "the fire science evidence in this case was as consistent with an accidental fire—started in an upholstered chair in a living room as petitioner claimed—as with an accelerant fire intentionally started."[234] The state offered no rebuttal evidence with its own expert.[235] Therefore, the court found that the fire "could have been caused *either* intentionally *or* by accident."[236]

After this finding, the court then addressed whether "this new evidence is legally sufficient to prove that [Albrecht] is *actually innocent*."[237] The court concluded that at most, Albrecht proved that the fire could have been accidental. In order to gain habeas relief, he had to prove that he "did not commit the crime."[238] In the eyes of the court, proving that he did not commit the crime is the same legal standard as determining whether there was sufficient evidence for a rational juror to conclude that the fire was caused by arson. The court elevated the *Schlup* standard as it applied it to this case. However, after *House*, the Supreme Court would likely apply a similarly strict legal standard to this free-standing innocence claim. Since Albrecht's initial conviction rested on more evidence than just the fire science, the court did not find him innocent of the

229. *See Id.* at 465 n.9.
230. *Id.* (quoting 28 U.S.C. § 2254(e)(2(A)(ii)).
231. *Id.*
232. *Id.*
233. *Id.* at 464.
234. *Id.* at 465.
235. *Id.*
236. *Id.*
237. *Id.*
238. *Id.*

crime.[239]

Albrecht's previous threats to his wife, combined with the fact that the science still showed that arson was a possibility—as was an accidental fire—was enough circumstantial evidence to prevent the court from granting this freestanding innocence habeas claim.[240] This is similar to the Supreme Court's analysis of the freestanding innocence claim in *House*, where despite exonerating DNA evidence, there was still enough circumstantial evidence pointing to Bell's guilt to prevent the Supreme Court from granting a freestanding innocence habeas claim.[241]

2. People v. Chase

At least one state court has granted a habeas challenge to an arson conviction.[242] In 1995 Jack Chase was convicted of committing arson in 1993.[243] Chase allegedly removed a propane gas hose from a propane tank in the basement and intentionally set a fire.[244] The fire damage showed that the fire started on the second floor, but the People's fire expert testified that even though propane gas was heavier than air, it built up in the basement, spilled into the second floor, and ignited on the second floor.[245] According to the People, all of this occurred within fifteen minutes of Chase allegedly removing the hose.[246]

Defendant filed the New York state equivalent to a federal habeas petition based on newly discovered evidence under N.Y.C.P.L.R. § 440.10(1)(g) (2006). This statute states:

> New evidence has been discovered since the entry of a judgment based upon a verdict of guilty after trial, which could not have been produced by the defendant at the trial even with due diligence on his part and which is of such character as to create a probability that had such evidence been received at the trial the verdict would have been more favorable to the defendant; provided that a motion based upon such ground must be made with due diligence after the discovery of such alleged new evidence.[247]

The defendant submitted three affidavits from unpaid ex-

239. *Id.* at 465–66.
240. *Id.*
241. House v. Bell, 547 U.S. 518, 555 (2006).
242. People v. Chase, No. I-040-95, 2005 N.Y. slip op. 51125U, at 10 (N.Y. Co. Ct. May 19, 2005).
243. *Id.* at 1–2.
244. *Id.* at 6.
245. *Id.*
246. *Id.*
247. *Id.*

perts in which they argued that newly discovered evidence since the 1995 trial would disprove the prosecution's theory of arson.[248] On the basis of these affidavits, the court granted an evidentiary hearing for newly discovered evidence and heard two separate fire science experts testify that a dislodged propane hose in the basement could not have caused the fire.[249] They testified that rather than settle on the ground, propane immediately and readily mixes with the air around it.[250] Thus, if the propane tank were tampered with, as the prosecution claimed, it would take several hours to create a combustible mixture, not fifteen minutes.[251] Further, since 1995, the type of propane tank found in the fire had been recalled because it was prone to rupture if unintentionally overfilled while cold, and then warmed.[252] The scene of the fire was consistent with a fire resulting from this type of problem.

The People responded by arguing "that the properties of propane have not changed since [the] discovery. . ." of the gas.[253] The court rebuffed this argument, stating "it is clear that scientists now have a better understanding of those properties and how they work. The new knowledge better explains the cause of the fire."[254] The court recognized that under New York law a court cannot decide innocence in a collateral attack to a conviction, in contrast to the ability of a federal habeas court under *Herrera*.[255] In the end, the court granted a new trial because there was certainly a probability of a more favorable verdict for Chase.[256]

Here, Chase was granted a new trial based on the newly discovered evidence. If Chase had not been granted this new trial, and had exhausted his state appeals, he could have then challenged his conviction in a federal habeas court. In a federal habeas court, he might have succeeded on a freestanding innocence habeas claim because his initial arson conviction in state court appears to be based entirely on the misunderstood nature

248. *Id.*
249. *Id.*
250. *Id.*
251. *Id.*
252. *Id.* at 6–7.
253. *Id.* at 9.
254. *Id.*
255. *Id.* at 9 ("While only a new trial jury can determine the defendant's guilt or innocence, the newly discovered evidence is of such a character as to create a probability of a more favorable verdict.").
256. *Id.* at 10.

of propane gas and propane gas tanks. Upon better understanding the science of propane gas and propone gas tanks, the court would likely find that there is no way that the fire could have been intentionally set. As opposed to *Albrecht*, where the court found that even in light of the new evidence it could not definitively conclude whether the fire was set accidentally or intentionally, here a court would likely conclude that the new evidence would have resulted in a more favorable verdict to Chase. This finding would be the type of language that a federal habeas court would need to employ to grant a freestanding innocence claim.

3. Souliotes v. Tilton

Currently, the Northern California Innocence Project is representing George A. Souliotes in his habeas petition to challenge his 2000 arson conviction stemming from a 1997 fire.[257] In this petition, Souliotes is asking for an evidentiary hearing based on newly discovered evidence stemming from a better understanding of fire science, or, in the alternative, habeas relief based on actual innocence.[258] At trial, the prosecution linked Souliotes to the fire scene because a substance, medium petroleum distillate ("MPD"), at one time thought to be residue of ignitable liquid, was found on his shoes.[259] It has since been discovered that similar forms of MPD are commonly found in rubber shoes.[260] Mr. Souliotes owns this common type of rubber shoe.[261] Moreover, the chemicals on the arson scene materials and the MPD on Souliotes' shoes are distinguishable. Thus, the shoe cannot be used to link Souliotes to the crime scene.[262] Without the shoe evidence, the prosecution does not have any reliable evidence linking Souliotes to the crime scene.

However, the district court did not address the merits of the case and instead dismissed the habeas petition on statute of limitations grounds.[263] In his briefing Souliotes did not address whether the actual innocence gateway of *Schlup* is applicable

257. Souliotes v. Tilton, No. 06-0667, 2008 WL 782479, at *5 (E.D. Cal 2007)(on file with author).
258. *Id.* at *5–8.
259. *Id.*
260. *Id.* at *5.
261. *Id.*
262. *Id.* at *8.
263. *Id.*

to federal habeas petitions barred by the statute of limitations; therefore, the court did not decide that issue either.[264] The court also did not grant a certificate of appealability, thus Souliotes will not likely have the opportunity to address his habeas claim before the Ninth Circuit.[265] Unfortunately for Souliotes, no federal habeas court will likely ever grapple with the issue of whether the new understanding of fire science would undermine his conviction.

CONCLUSION

The state of fire science has undergone major changes in the past three decades. Just as many commonly held beliefs among fire investigators have been discredited during this time period, arson convictions that relied on those scientific methods may have been discredited too. Scientists continually revamp their knowledge and methodology to conclude, with greater accuracy, whether physical fire remnants can be translated into conclusions about a fire's origin. Unfortunately, while fire science advances, many prisoners who were convicted of arson based largely on now discredited science are left behind. Often the main avenue of relief for these prisoners is found within the federal habeas statute. Although the habeas statute does not clearly anticipate challenges brought resulting from a debunking of old science, a fair reading of the statute should grant these prisoners relief. The most attainable type of habeas relief for these prisoners is an evidentiary hearing. A freestanding innocence claim could be used to challenge an arson case, although success is unlikely.

Though the federal habeas statute can appear daunting, it may provide the only avenue of relief for individuals wrongly convicted of arson if they have exhausted all state remedies, or state remedies are inadequate for this kind of challenge. If courts treat newly discovered knowledge the same as newly discovered evidence, these prisoners could turn to this statute to attain relief.

264. *Id.* at *9.
265. *Id.*