

## THE MYTHS OF ARSON INVESTIGATION PROSECUTING NON-CRIMES

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Almost everyone is aware of the impact DNA testing has had on the criminal justice system. For individuals fortunate enough to have physical evidence to test, it has provided a way to prove their innocence. In most cases, exculpatory DNA test results have been accepted as conclusive proof of innocence.<sup>1</sup> In the majority of the cases, however, there is no physical evidence. No one can seriously argue that some of those persons are not also innocent. The problem is how to prove that without scientific evidence.

Many people believe that most of the DNA cases have now been identified, and the number of exonerations based on DNA results will probably start to decline. Some have suggested that the next wave of exonerations will be in arson cases. This article will attempt to explore why almost everyone has looked at the testimony in the older arson cases accept that there are problems with many of those cases, and hopefully provide information that every attorney needs to have.

Arson cases are different from most other prosecutions. In most cases the argument is over who committed the offense. There is a rarely an argument that no crime was committed. In an arson case, however, there is no criminal case unless someone first

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<sup>1</sup>As of the first part of August, 2008, there have been 200 exonerations, most of which have been the result of DNA. See, [www.innocenceproject.org](http://www.innocenceproject.org)

determines a crime was committed. That generally involves a determination of whether a fire was intentionally set; if it was the result of an accident, then there is no crime.

The problem with arson prosecutions is that the determination of whether or not a crime was committed is left to experts. Most of the so called experts, however, are not scientists; some may not even have a college degree. Most such experts are fire fighters, or individuals in a fire marshal's office. Their education has generally consisted of an initial school, and on the job training. The result has been that much of what has been generally accepted has no scientific backing. Several leading arson experts have characterized the state of knowledge prior to 1992 as "a collection of myths." See, *Arson Review Committee, Report on the Peer Review of the Expert Testimony in the cases of The State of Texas v. Cameron Todd Willingham and The State of Texas v. Ernest Ray Willis* (2006) <sup>2</sup>

In 1985, the National Fire Protection Association Standards Council recognized the problems with the reliability of fire investigations, and formed a committee to prepare a set standards. The result of that committee was *NFPA 921, Guide for Fire and Explosion Investigations*, which was published in 1992. Unfortunately, the fire investigation community refused to accept or recognize the document. For those investigators trained before 1992, they may not have even been aware there was such a

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<sup>2</sup>Much of the material in this article was taken from that report. It is an excellent resource, because it examined two cases that involved testimony that was reflective of what was believed at the time. The testimony in those two cases was nearly identical, even though different witnesses were involved. Based on that, it should be expected that almost identical testimony was presented in other cases. You can find it at <http://www.innocenceproject.org/docs/ArsonReviewReport.pdf>

document. *NFPA 921* has been amended several times, and in 2000 the International Association of Arson Investigators formally adopted *NFPA 921*. However, that does not mean that it was used, and many investigators are probably still not even aware of the standards that exist.

## COMMON MYTHS

### A) Pour patterns

In many cases, the fire investigator concluded the fire was intentionally because of what they believed were pour patterns on the floor. In other words, they interpret what they see as the result of a flammable liquid being poured on the floor, and ignited; the theory is that there will be more damage to that portion of the floor, which is what they are seeing. While that has some common sense appeal, it has no scientific validity. It is now accepted that you cannot determine whether markings on a floor are associated with a flammable liquid, unless samples are taken, and confirmed by testing. The reason that markings on a floor cannot establish anything has to do with the physics of fire. In a compartment fire (such as a house), the fire may start relatively small, and continue burning. The fire produces a column of heated gas (the thermal plume), which rises to the top. When the fire reaches a ceiling, it is forced to spread horizontally. Eventually the thermal plume will encounter walls, which forces it back down. Eventually a layer will develop at the ceiling, which is called the upper layer. Mass and energy are transported to the upper layer through the thermal plume. If the fire continues to burn, the depth of the upper layer continues to increase. When the temperature reaches 1,100-1,200 degrees

Fahrenheit, thermal radiation causes every exposed and easily combustible material in a room to ignite. This is described as the “onset of flash over” , and marks a change where everything in a compartment will burn; the fire is no longer dominated by the burning of the first item. This stage can be referred to as full room involvement, or a fully developed fire. In this stage, the fire is controlled by ventilation - the size of the fire is determined by the amount of air coming into the compartment. In this stage of a fire materials lining the compartment, such as floors, ceilings and walls can be burned. At this stage, the entire compartment is filled with flames.

The failure to understand the effects of a fully developed fire has resulted in false and misleading testimony. In many cases, investigators pointed to pour patterns and puddle marks, as evidence of arson; the theory is that is where the fire started, it burned hotter from the flammable liquid used, thereby leaving the mark. That explanation makes sense, and has a common sense appeal for jurors. Unfortunately, it is not scientifically valid. There is no way from mere observation to determine whether a mark was the result of a flammable liquid, or full room involvement. The failure to understand this can result in criminal charges in almost any case involving a fully developed fire, because there almost always be those marks. This is significant because arson investigators have traditionally based their opinion on multiple points of origin. The theory is that an accidental fire will only have one point of origin. Therefore, if there are several points of origin, the fire must be intentionally set. The problem lies with determining a point of origin; as noted above, that cannot be done by mere observation.

## B) Burned springs

Another popular myth is that evidence of burned springs under a bed, or some other item of furniture, establishes the fire was burning under the item, which could only result from some type of flammable liquid being placed there and ignited. Experiments have established that where a fully developed fire is involved, all areas can burn, including areas under furniture. Additionally, where polyurethane foam is present, it can melt, drip and form “pool fires” on surfaces under the furniture.

## C) Accelerant fires burn faster

Yet another misconception was that accelerant fueled fires burn faster. This myth has been used to support testimony that an accelerant was used because certain material (like aluminum) will not burn in a “normal” fire. Tests have been conducted which establish that this is false. All the tests and experiments have concluded that an accelerant fueled fire is going to burn at the same temperature as a wood fire.

## D) Fire burns up, so ceiling is hotter than the floor

Another common error was a belief that in a normal fire, the ceiling area should be hotter than the floor, since fire travels up. As a result, where the extensive damage to the floor, investigators concluded that an accelerant was used. Again, this is the result of a failure to understand fire dynamics. In a fully developed fire, there is no difference in temperature between the floor and the ceiling. Additionally, in most houses there are more materials on the floor, and therefore there is more to burn.

## E) V-patterns

Many fires produce what is often described as a V pattern. Fire investigators have testified that proves the fire started on the floor. Charred patterns on baseboards are also used to establish the fire started on the floor, thus indicating arson. Experiments have established that “V” patterns will exist in most compartment fires, and cannot be used as an indicator of arson. All a V pattern indicates is that a fuel package (like a chair) burned during the course of the fire. The pattern cannot establish when the item burned, and cannot be used to establish the fire started in that area.

#### F) Crazed glass

One of the more intriguing facts relied on by fire investigators was “crazed glass” - broken glass that has spider webbing. Investigators frequently testified that is caused by a fire that burns hot and fast, which is indicative of an accelerant. The spidering is actually the result of rapid cooling, such as putting water on the fire; it can also be the result of mechanical breaking, which often occurs during the course of trying to extinguish the fire. Unfortunately, this factor was published in a number of manuals, and taught at the National Fire Academy for a number of years.

#### G) Burned doorjambs

Burned doorjambs is another factor that investigators used to find significant. If the floor is charred underneath the jamb, investigators concluded that a flammable liquid was poured there. In fact, even if a flammable liquid was under a jamb it would not ignite, because there is no air. Again, investigators fail to understand the dynamics of fire, including the conductivity of materials. Aluminum is an especially good conductor of

heat, which means the heat from above is going to be transferred to the floor. The end result is the floor under the threshold will be charred. Again, that is nothing more than an indication there was a fire in the room.

## CONCLUSION

Arson is a science, that involves the application of several different sciences. Knowledge about fires requires a number of distinct disciplines. Unfortunately, in the past arson investigators have not turned to the scientific community for help or support. Perhaps more unfortunately, few lawyers have sought out real scientists to consult with. The result for many years has been that the conclusion of the initial investigator has been accepted without challenge. We need to look at those cases again, and determine whether these problems exist in other cases. There are no doubt defendants serving time in prison because of this false testimony; they are serving time for something that was not a crime. The challenge will be to convince the courts to grant relief in these cases. The first step is to identify the problem, which hopefully this article will help you do. The next step is to submit the case to a real expert; one who understands the science, and recognizes the myths.

As with all areas involving the forensic sciences, don't accept the opinions of the State's experts without question. Although more investigators now understand the science of fire investigation, there are still a number operating under the same old myths. At a minimum, the investigator should be aware of *NFPA 921*. Of course, knowledge doesn't equate with competence. If there is any question about what happened, you should obtain

your own expert. Make sure they also understand the current science; as with any experts, there are those who are competent, and those who are not. With competent assistance, hopefully we can make sure that no one else is convicted for an accident.