COMMONWEALTH OF MASSACHUSETTS

MIDDLESEX, SS. MIDDLESEX SUPERIOR COURT
NO. 82-2399-2407

COMMONWEALTH OF MASSACHUSETTS

v.

VICTOR ROSARIO

AFFIDAVIT OF JOHN J. LENTINI, CFI, D-ABC

I, John J. Lentini, do swear and depose that:

1.

I am a fire investigator with 35 years experience in the forensic sciences. I have been retained by Counsel for Victor Rosario to review the fire scene evidence in the case against Mr. Rosario. A copy of my resume is appended hereto as Exhibit 1.

2.

I have investigated more than 2,000 fires and have been accepted as an expert witness on more than 200 occasions. I have been accepted as an expert in fire investigation, chemical analysis of fire debris, the

standard of care in fire investigation, and the standard of care in chemical analysis of fire debris.

3.

I am a Certified Fire Investigator and a Diplomate of the American Board of Criminalistics (D-ABC) with a specialty in fire debris analysis, and as such, I have extensive education, training and experience in fire investigation, the chemical analysis of fire debris, and the standards of care that apply to these disciplines. I hold certifications from both the International Association of Arson Investigators (IAAI) and the National Association of Fire Investigators (NAFI).

4.

I have served on the IAAI Forensic Science Committee and am a Past Chair of that committee. I am also a past member of the Board of Directors of the American Board of Criminalistics and have been the Chair of the American Society for Testing and Materials (ASTM) Committee E-30 on Forensic Sciences. I am Past Chair of ASTM Subcommittee E30.01 on Criminalistics. In 1998 I was selected by the U.S.

Justice Department as one of two civilians to serve on a panel for a document setting forth national guidelines for fire and arson investigation, which was published in June 2000 *as Fire and Arson Scene Evidence: A Guide for Public Safety Personnel*. I am also principal Member of the National Fire Protection Association (NFPA) Technical Committee on Fire Investigations.

5.

My full-time occupation involves the investigation of fires and the examination of physical evidence from fire scenes, as well as review of the work of other investigators in these disciplines. I have analyzed or supervised the analysis of more than twenty thousand fire debris samples in my career.

6.

I have studied extensively regarding the standard of care for fire investigation and the standard of care in the chemical analysis of fire debris samples. My work with the IAAI Forensic Science Committee, with ASTM Committee E30 on Forensic Sciences, and with the NFPA Technical Committee on Fire Investigations makes

me qualified to inform the Court on the history and evolution of the state of the art in fire investigation and chemical analysis of fire debris.

7.

In 2006, I was invited by The Innocence Project to join a panel commissioned to prepare a *Report on the Peer Review of Expert Testimony in the cases of State of Texas v. Cameron Todd Willingham and State of Texas v. Ernest Ray Willis*.[1] Mr. Willingham and Mr. Willis were convicted of arson/homicide on the basis of artifacts routinely created by accidental fires that progress beyond flashover, similar to those artifacts relied on by the witnesses in the Rosario case. In 2004, Mr. Willis was exonerated; Mr. Willingham was executed. "After a review of the scientific basis for the determination of arson, the prosecutors in the Willis case acknowledged that his conviction was based on faulty science and unreliable indicators of arson. Even though, for all practical purposes, the interpretations of the physical evidence as testified to in the Willis trial were the same as in the

[1] Available at www.InnocenceProject.org

Willingham trial, and after a similar review determined that the conviction was also based on unreliable indicators, no such acknowledgment has come forward from the prosecutors in that case." Id. at pp. 3-4. The Texas Forensic Fire Commission is currently reviewing the Willingham case for negligence of forensic analysts.

8.

In 2007, I was invited to give a presentation on "The State of the Art in Fire Investigation" to the National Academy of Science during its preparation of the report, *Strengthening Forensic Science in the United States, A Path Forward*,[2] that had been commissioned by the United States Congress. The conclusion of the report was that the forensic sciences, with the exception of DNA science, have not been "rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a specific individual or source. In terms of scientific basis, the analytically based disciplines generally

[2] Available at www.just-science.org/report.html

hold a notable edge over disciplines based on expert interpretation." Id. at p. 7.

The report reviewed the status of many forensic disciplines including fire investigation. The report stated:

> [M]uch more research is needed on the natural variability of burn patterns and damage characteristics and how they are affected by the presence of various accelerants. Despite the paucity of research, some arson investigators continue to make determinations about whether or not a particular fire was set. However, according to testimony presented to the committee, many of the rules of thumb that are typically assumed to indicate that an accelerant was used, (e.g. alligatoring of wood, specific char patterns) have been shown not to be true. Experiments should be done to put arson investigation on a more solid footing. Id. at p. 173.

9.

Virtually all the indicators relied on by the witnesses at the Rosario trial in 1983 have been shown over the last twenty years to be just such untrue rules of thumb. These indicators included heavy, low burning in floor areas, burning under door sills and thresholds, burning between the cracks of wood floorboards, fire that was not continuous, bubbles on kitchen tile floor, and very hot, rapid fire. At the

time of the Rosario trial, many of these inaccuracies were generally accepted by the investigative community as true. Fire protection engineers, who were gaining fundamental knowledge of physics, chemistry, thermodynamics, fluid flow and heat transfer and learning about post-flashover fire artifacts did not interact with fire investigators who resisted adopting the newly discovered knowledge about the behavior of fire.

10.

In the early 1980s, fire protection engineers working at the Center for Fire Research at the National Bureau of Standards (now known as the National Institute of Standards and Technology) conducted research on the behavior of confined fires (known as compartment fires), and studied a phenomenon known as "flashover." Flashover is a transition phase in the development of a compartment fire in which surfaces exposed to thermal radiation reach their ignition temperature more or less simultaneously and fire spreads rapidly throughout the space, resulting in full room involvement or total involvement of the

compartment or enclosed space. Flashover occurs in a compartment fire when the hot layer produced by the fire at the upper portions of the compartment reaches a temperature of approximately 1200 degrees Fahrenheit. At that temperature every exposed combustible surface in the room becomes ignited within a matter of seconds. This includes the surface of flooring materials. It also includes baseboards and trim around doorways. Compartment fires that have become fully involved, as the first floor of 32 Decatur street, will leave burn patterns on the floor that are indistinguishable from the burn patterns produced by ignitable liquids.

11.

The first time that the phenomenon of flashover became widely known to the fire service was in 1984, when the National Fire Protection Association (NFPA), based in Quincy, Massachusetts, released an educational video tape called "Countdown to Disaster." An excerpt from the film that shows flashover occurring in a test fire is attached to this affidavit as Exhibit 2. The excerpt requires less than 5 minutes

to view, and it would be worth the Court's while to view it in order to gain an understanding of a how a fire behaves when confined by a structure, and particularly how a fire of accidental origin can cause floor-level damage. Even then, while the tremendous power of confined fire was known, the artifacts left on the floor after such a fire were not explored in great detail.

12.

In 1991, I participated in a dramatic demonstration of the inaccuracy of many of the so-called rules of thumb regarding the artifacts of an incendiary fire. Gerald Wayne Lewis had been indicted in Jacksonville Florida for setting a fire that killed his pregnant wife, his wife's sister and her four children. Investigators for the Duval County Sheriff's office relied on pour patterns, and burning under the furniture as evidence of the use of a flammable liquid to ignite the fire. The theory was that floor-level burn patterns were indicators of flammable liquid because the fire burned hotter and faster when it was fueled by an accelerant. Lewis claimed that the fire

had started on a couch and got out of control so quickly he barely escaped with his three year old son. I was hired to assist the prosecution in reconstructing the fire in a virtually identical neighboring house that had been condemned. We started the fire on the couch in accordance with Lewis's explanation of the fire. To our surprise, the resulting fire was as intense and quick to go to flashover as the original fire. Similar "pour patterns" resulted where we had left boxes of old clothes and newspapers. The low burning was the same in the staged accidental fire as in the alleged incendiary fire. From that experiment it was clear that once a fire progresses to full room involvement, it is no longer valid to make a determination using visual cues alone. A week after the experiment, the prosecution dismissed the charges against Lewis.

13.

One of the first cases in which your affiant was retained as a reviewing expert involved the review of an arson/homicide conviction in Arizona, where the original trial judge, James Sult, commissioned me to

review photographs and testimony as I have done in the Rosario matter. The case was State v. Ray Girdler, 675 P.2d 1301, 138 Ariz. 482 (Ariz. 1983), Mr. Girdler was convicted in 1982 and sentenced to two life sentences plus 21 years.

14.

As a result of an eleven-day evidentiary hearing, Judge Sult became convinced that the evidence used to convict Mr. Girdler (much of which is very similar to that used to convict Mr. Rosario) was based on a misunderstanding of fire behavior. Judge Sult issued his findings of fact and conclusions of law on January 2, 1991. Judge Sult granted the Motion for a New Trial because he concluded that the Girdler fire could reasonably have been "attributed to noncriminal causes." The same is true of the Rosario case for many of the same reasons. A copy of Judge Sult's order is attached hereto as Exhibit 3.

15.

In 1992 the National Fire Protection Association (NFPA), the largest professional fire protection organization in the world, published *NFPA 921, Guide*

for Fire and Explosion Investigations. NFPA standards are developed through a consensus standards development process approved by the American National Standards Institute. This process brings together volunteers representing varied viewpoints and interests to achieve consensus on fire safety and other issues.[3]

16.

NFPA 921 is a consensus document reflecting the knowledge and the experience of fire engineering, legal and investigative experts across the United State. This document is continuously reviewed, public proposals and comments are solicited, and a revised edition is produced every 3-4 years. It 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.

17.

NFPA 921 provided guidance on interpretation of post fire artifacts, based on empirical testing. NFPA

[3] NFPA 921, 2008 edition, Important Notices and Disclaimers concerning NFPA Documents, NFPA, Quincy, MA, inside front cover

921 systematically disproved many of the myths of arson investigation including all those indicators relied on in the Rosario trial:

a. Heavy, low burning in floor areas: [4]

Chapter 6, Fire Effects and Fire Patterns

6.3.2.4 Full Room Involvement-Generated Patterns

"If a fire progresses to full room involvement, damage found at low levels in the room down to and including the floor can be more extensive due to the effects of radiant flux and the convected heat from the descending hot gas layer and the contribution of an increasing number of burning fuel packages. … As the hot gas layer descends to floor level, damage will significantly increase. Damage can include charring of the undersides of furniture and in corners, burning of baseboards, and burning on the undersides of doors. … Although the degree of damage will increase with time, the extreme conditions of the full room involvement can produce major damage in a few minutes, depending on ventilation and fuels present." (Total room involvement occurs after flashover, see 3.3.74)

6.3.3.2.3 Fire Patterns

[4] These cites are taken from the 2008 edition of NFPA 921

"Burning between seams or cracks of floorboards or around door thresholds, sills, and baseboards may or may not indicate the presence of an ignitable liquid. Standard tests involving flooring materials such as ASTM E 648, regularly produce burning between seams or cracks of floorboard assemblies from radiant heating alone. The knowledge of the pre-fire condition of floorboards, sills, and baseboards can assist in this assessment."

6.3.3.2.4 Fire Patterns

"Full room involvement can also produce burning of floors or around door thresholds, sills, and baseboards due to radiation, the presence of hot combustible fire gases, or air sources (ventilation) provided by gaps in construction. These gaps can provide sufficient air for combustion of, on, or near floors."

6.3.7.8.5

"The presence of an ignitable liquid should be confirmed by laboratory analysis. The determination of the nature of an irregular pattern should not be made by visual interpretation of the pattern alone.

b. Discontinuous fire leading to the conclusion of two points of origin

Chapter 17, Origin Determination

17.4.1.3 Pattern Generation

"The investigator should not assume that the fire at the origin burned the longest and therefore the fire patterns showing the greatest damage must be at the area of origin. Greater damage in

one place than in another may be the result of differences in thermal exposure due to differences in fuel loading, the location of the fuel package in the compartment, increased ventilation, or fire-fighting tactics."

17.4.1.3.1
"The size, location, and heat release rate of a fuel package may have as much effect on the extent of damage as the length of time the fuel package was burning. An area of extensive damage may simply mean that there was a significant fuel package at the location."

17.4.1.4 Ventilation
"Full room involvement conditions can cause fire patterns that developed during the earlier fuel-controlled phase of the fire to evolve and change. In addition, fires can produce unburned hydrocarbons that can be driven outside the compartment through ventilation openings. This unburned fuel can mix with air and burn on the exterior of the compartment, producing additional fire patterns that indicate the fire spread out of the original compartment. Thus, knowledge of changes in ventilation (e.g., forced ventilation from building systems, window breakage, opening or closing of doors, burn-through of compartment boundaries) is important to understand in the context of fire pattern analysis. Determination of what patterns were produced at the point of origin by the first item ignited usually becomes more difficult as the size and duration of the fire increases. This is especially true if the compartment has achieved full room involvement."

c. incendiary fires are hotter, faster than accidental fires

22.2.8 Assessment of Fire Growth and Fire Damage

"Investigators may form an opinion that the speed and fire growth or the extent of the damage was greater that would be expected for the "normal" fuels believed to be present and for the building configuration…"

22.2.8.1
"What an investigator may consider as "excessive" "unnatural" or "abnormal" can actually occur in an accidental fire, depending on the geometry of the space, the fuel characteristics and the ventilation of the compartment."

18.

NFPA 921 contains numerous warnings about previously held misconceptions concerning the proper interpretations of post-fire artifacts. NFPA 921 contains more warnings about interpreting irregular patterns on the floor by visual appearance alone than on any other subject. This is because the technical committee members recognize that this particular type of misinterpretation has been responsible for numerous erroneous determinations of fire cause.

19.

The International Association of Arson Investigators (IAAI) resisted the conclusions of the NFPA 921 until the year 2000. That is the year in which the scientific approach to fire investigations finally became generally accepted in the fire investigation community. In 2000, the United States Department of Justice (US DOJ) released a pamphlet entitled *Fire and Arson Scene Evidence: A Guide for Public Safety Personnel.* In that publication the US DOJ stated that NFPA 921 was "the benchmark for the training and expertise of everyone who purports to be an expert in the origin and cause determination of fires."

20.

Shortly after its release, the US DOJ document began appearing in trials where the issue of the standard of care for fire investigations was being litigated. Beginning in 2001, courts started to cite NFPA 921 as a standard of care, some going so far as to call it "the gold standard." A brief description of 11 cases wherein the court has found that NFPA 921

represents the standard of care in fire investigations appears in an article prepared by your affiant for the Canadian Association of Fire Investigators Journal entitled *The Standard of Care in Fire Investigation*. The article is attached hereto as Exhibit 4. All of the cases cited in the article were decided in 2001 or later.

21.

I have been provided with testimony and photographs, including color images of the fire in progress, and scanned black and white images of the scene after extinguishment. I have reviewed the trial testimony of the following individuals, who were presented as experts by the Commonwealth: David Coonan, William Gilligan and Harold Waterhouse.

22.

The threshold issue in this or any arson case is whether the fire was, in fact, incendiary, or whether it was an accident. For the reasons listed below, it is my professional opinion that the Commonwealth failed to demonstrate that the fire was intentionally set. The artifacts relied upon to prove arson were

invalid, and as a result of being misled by those artifacts, the Commonwealth's investigators failed to examine and rule out potential accidental fire causes.

23.

The Commonwealth alleged that the defendant and two other men each threw a Molotov cocktail into the residence where the fire occurred. In my opinion, based on my education, training, and experience, this is a very unlikely scenario because no remains of Molotov cocktails were recovered, nor were any of the samples collected positive for the presence of gasoline.

24.

It has been my experience that when Molotov cocktails are used, there is always physical evidence remaining behind. Certainly, the fire would not have destroyed the beer bottles that were alleged to have been used. Molotov cocktail remains include the bottles, portions of the wick that were inside the bottle, and ignitable liquid residues. Further, *Kirk's Fire Investigation*, a text that most fire investigators regard as authoritative states,

> Although the use of such a device is convenient from the standpoint of the arsonist its easy detection at a fire scene makes it less than ideal. A broken bottle, often a broken window. and perhaps eyewitnesses accompany its use. Tracing it to the arsonist may be difficult but often it is not. The broken bottle will usually be at the bottom of the fire where it is exposed to the minimum amount of heat, so fire damage to the fragments is minimal. The portions of the bottle bearing the most information about its origin-the neck with its labeling and the base with its cast-in production data (date and place of production and product code)-are the pieces most resistant to mechanical and fire damage and usually survive intact.

The concepts from this paragraph are discussed in every edition of *Kirk's* dating back to the first edition in 1969. The entire passage from *Kirk's Fire Investigation, Fourth Edition (1997)* is attached hereto as Exhibit 5.

25.

The fact that despite a diligent search, the Commonwealth's investigators failed to find any physical evidence of Molotov cocktails strongly indicates that no such devices were ever present. The glass shards that were found were sent to the FBI for analysis but no evidence that these shards were part

of a Molotov cocktail was found. NFPA 921 at 22.2.7.1 states, "Molotov cocktails leave evidence in the form of ignitable liquid, chemicals, or compounds used within them, the broken containers and wicks." In addition, the eyewitness who allegedly saw someone throw the Molotov cocktail would have seen the flame from the burning wick before it was thrown and/or the flame from the explosion when the bottle hit the floor. Beer bottles, in fact, make poor vessels for Molotov cocktails because of their resistance to breaking when thrown at wood or other surfaces softer than the glass.

26.

The other "indicators" used by the Commonwealth's experts were low burning, i.e., charring at floor level, and an interpretation of "lesser" burning in the living room to suggest that there was an accelerant on the floor[5,6,7] and that there were two

[5] From the trial testimony of David Coonan, beginning at page 3-243:
A: Yes, my opinion, based on the type of burning and the intense amount of charring, it was a very volatile, hot, intensive, low-burning fire, a very rapid burning fire.

points of origin: one in the front hallway and one in

Q: And do you have an opinion as to whether it was an incendiary fire? …
A: It was an incendiary fire. …
Q: Do you have an opinion, Sergeant, as to whether or not an accelerant was used?
A: Yes.
Q: And what's your opinion?
A: That an accelerant was used.

[6] From the trial testimony of William Gilligan beginning at page 5-424:
Q: And sir, based on your opinions or based on your observations as to the exterior of the building as well as the interior of the building, your observations as to separate fires as well as the charring that was involved, that you've just mentioned and the burn pattern as well as the sequence of speed—strike that—as well as the time of the first alarm and observations of the firemen when they first arrived at the fire, based on those considerations, Lieutenant, did you arrive at an opinion as to the nature or cause of the fire?
A: Yes.
Q: What was your opinion?
A: That the fire was deliberately set and an accelerant was used.

[7] From the trial testimony of Harold Waterhouse at page 4-319:
Q: As far as the burn pattern was concerned, was that significant in your determination that a liquid accelerant was used?
A: Yes.
Q: And why was that?
A: Well, as I said, the burn pattern on the floor showed indication. There were tiles on the floor. You could see bubbles in it. That's consistent with a flammable liquid being laid on those tiles, or running onto the tiles.

the kitchen.[8,9,10] Because each of the rooms in which these investigators observed the artifacts were "fully involved compartments," their interpretations of those artifacts were not based upon evidence that is viewed today as being scientifically accurate and reliable.

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[8] From the trial testimony of David Coonan at page 3-239
A: I determined that there were at least two points of origin.
Q: And what do you base that on?
A: I based it on extremely low burning, heavy charring, patterns that burnt into the floor, evidence of a flammable, flowing fluid, and the fact that the two fires are isolated mainly by that common wall, which wasn't penetrated by fire from one room to the next.

[9] From the trial testimony of William Gilligan at page 5-423:
Q: And what did you base this opinion on, that there were separate fires?
A; Well, the intense burning, the burn pattern, the low burning. I could see no accidental reason for the separate fires. There was a lesser degree of burning between the two fires, appeared to be definitely separate fires.

[10] From trial the testimony of Harold Waterhouse at page 4-318:
Q: What do you base your opinion on that there were these separate fires?
A: There's no communication. The hall had heavy burning, and it went up the stairs. … And then the fire lessened its damage in the kitchen as it got to the wall for the hallway and towards the bedroom where the victims were found

27.

Although the Commonwealth's experts' interpretation of the artifacts they observed represented generally accepted interpretations in 1983, it has been a decade or more since they have been discredited, and they were never correct.

28.

Low burning or charring on the floor was once thought to indicate the presence of ignitable liquids, because "heat rises, and fire does not burn downward unless it has 'help.'" This is now known to be false when applied to compartments (rooms) that reach full involvement, as the hallway, living room and kitchen in the first floor apartment in this case all did. In order to make a valid assertion that ignitable liquid was present, a positive laboratory result is required. The lab results in this case were all negative.

29.

Even in 1983, it was not legitimate to make a determination of multiple origins based on "lesser burning" between two areas. In this case, the living room, which was a fully involved compartment,

connected the kitchen and the hallway. The heavier burning in the kitchen and the hallway was almost certainly a result of variations in ventilation, and not of separate origins.

30.

In the early stages of a fire, it grows as it involves additional fuel. The fire at this stage is called a "fuel-controlled" fire. Once all of the fuel has become involved, the fire grows as it mixes with more air. This is called a "ventilation-controlled" fire. Fully involved or post flashover compartments contain ventilation-controlled fires.

31.

Based on my observation of the images of the fire in progress, I am of the opinion that there can be no doubt that the fires in the kitchen, living room and hallway were all ventilation-controlled. As such, the fire damage would have been mainly influenced by ventilation, not by the duration of burning in a particular room. The effects of ventilation on fires were poorly understood until recently. Ventilation effects are still the subject of serious fire

research. A treatise on the subject of artifacts caused by ventilation in post flashover fires is attached hereto as Exhibit 6.

32.

All of the misinterpretations made by the Commonwealth's experts in this matter have been shown repeatedly to be invalid long after the case was tried. Based on the current understanding of the fire investigation community, this fire would have been investigated more thoroughly. Because of their having been misled by faulty "indicators" of arson, the Commonwealth's investigators did not even consider the possibility of an accidental cause.

33.

The floor plan of the first floor of 32 Decatur Street prepared for trial by the prosecution showed the location of a heating unit in the living room. Mr. Waterhouse testified, "It was a clear night, even a little bit of snow coming down." [Tr. 4-317]. Thus, it is reasonable to assume that the heater was probably in use. Yet the heater in the living room was not even

examined.[11,12] None of the surviving tenants of the building were interviewed to determine the location of other heating units, appliances and electrical outlets or connections. In order to properly eliminate an electrical cause, especially in a homicide investigation, a detailed systematic inspection and analysis of the electrical system and any and all appliances, extension cords, etc. is necessary. This was not done.

34.

For all the reasons stated above, it is the professional opinion of your affiant that the Commonwealth's investigators failed to produce any

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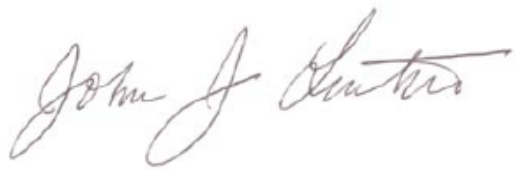
[11] From the trial testimony of David Coonan at page 3-250:
Q: When you came upon the building, did you examine this heating unit that I point to as being in the living room?
A: No.
Q: Did you notice it there?
A: No.

[12] From the trial testimony of Harold Waterhouse at page 4-363:
Q: Did you notice a heating unit in there?
A: I don't remember if there's a heating unit in the living room or not.
Q: After looking at the diagram, does that refresh your memory as to whether there was a heating unit?
A: I don't remember.

valid or reliable evidence that this fire had more than one point of origin, or that liquid accelerants were used to set the fire.

FURTHER AFFIANT SAYETH NAUGHT.

Sworn to under the pains and penalties of perjury this 15th day of June, 2010



JOHN J. LENTINI, CFI,D-ABC