

**IN THE COURT OF COMMON PLEAS PUTNAM COUNTY, OHIO
STATE OF OHIO,**

Case No. CR86-21

**Plaintiff / Respondent,
V.
KENNETH T. RICHEY,**

**Evidentiary Hearing Requested
Defendant / Petitioner**

AFFIDAVIT OF ANDREW T. ARMSTRONG, Ph. D.

I, Andrew T. Armstrong, Ph. D., being first duly sworn according to law, state the following:

QUALIFICATIONS

1. I am a Certified Professional Chemist specializing in the field of forensic science. I am the owner and Vice President of Armstrong Forensic Laboratory, Inc., a private laboratory located in Arlington, Texas that provides specialized testing on the detection and identification of flammable liquids in suspect fire debris.
2. I obtained a Bachelor of Science degree from North Texas State University in 1958, a Master of Science degree from North Texas State University in 1959, and a Ph. D. in chemistry from Louisiana State University in 1967. (Vita attached hereto as Exhibit A).
3. At the University of Texas at Arlington, I was an Assistant Professor of Chemistry from 1968-72 and an Associate Professor of Chemistry from 1972-84.
4. In addition to being a Certified Professional Chemist recognized by the American Institute of Chemists, I am recognized as a Fellow by the American Institute of Chemists, a Fellow by the American Academy of Forensic Science, and a Fellow of the American Board of Criminalistics. Armstrong Forensic Laboratory, Inc. is recognized as an Accredited Laboratory by the American Industrial Hygiene Association.
5. I have been a member of the Forensic Science Committee of the International Association of Arson Investigators since 1990. Additionally, I am a member of the North Texas Association of Arson Investigators, the Texas Advisory Council on Arson, the National Fire Protection Association, and the American Society of Testing Materials. Within the American Society of Testing Materials, I am a member of the Task Force on Gas Chromatography/Mass Spectrometry in Fire Residue Analysis.
6. I have been an honorary member of the Arlington Fire Department since 1977, and was given the White Helmet Award (the highest civilian award) by the Arlington Fire Department in 1977. I received the President's award from the Houston Fire Fighters Association in 1989 for "Exemplary Standards and Professionalism in Forensic Chemistry." I was appointed Honorary Fire Chief by the City of Houston Fire Department in 1992 in "Recognition and Appreciation for Contribution, Support, and Service to the Fire Service.
7. I have authored 19 publications and 36 lectures and papers, many of which address the identification of ignitable liquids in fire cause analysis.

DEFINITION OF PROJECT

8. I was hired by counsel for Kenneth Richey to review and analyze the chromatograms and arson report from the Ohio Arson Crime Laboratory concerning the fire incident that occurred at the Old Farm Village Apartments, 631 West Sycamor Street, Columbus Grove, Ohio (the "June 30, 1986 fire").
9. The purpose of my study was to offer an opinion concerning:
 - a. Whether, based on the chromatographic data supplied, the samples from the fire scene contain an identifiable ignitable liquid;
 - b. Whether the conclusions reached by the Ohio Arson Crime Laboratory are scientifically valid; and
 - c. Whether the expert witness initially retained by Kenneth Richey, Gregory DuBois, rendered competent expert assistance.
10. The documentation that I reviewed were:
 - a. Chromatograms and arson report from the Ohio Arson Crime Laboratory dated July 28, 1986 ("1986 Report") (attached hereto as Exhibit B);
 - b. Trial testimony of Dan Gelfius, Forensic Chemist, Ohio State Arson Crime Laboratory.
 - c. Trial testimony of Gregory DuBois, expert initially hired by Kenneth Richey
 - d. Gregory DuBois' investigative file; and
 - e. Trial testimony of Robert Cryer, Assistant State Fire Marshall for the State of Ohio.
11. As general background information, chromatography is a process to analyze accelerants from fire debris samples for the purpose of detection and identification. The sample of debris is immersed in a pre-tested "blank" of chemical solvent. The blank is pre-tested to identify its chemical structure so that its components will not be confused with those recovered from the sample debris. The immersion of the sample of debris in the chemical solvent acts to extract any volatile substances from the sample and holds the extracted substances in solution. The solution is then concentrated. The concentrated solvent is tested by gas chromatography, a process in which the dissolved substances from the sample are "partitioned" (separated) from the solvent blank and other components. As the mixture is analyzed by the gas chromatograph, a unique pattern of individual compounds is produced. The chemical structure of every mixture has a characteristic pattern for the analytical condition. The pattern consist of peaks and valleys. The peak size represents the relative abundance of the component in the sample. The peaks are described as "points of correlation. " The peaks are identified by the length of time it takes for the individual compounds to pass through the chromatograph. This time is also known as the "retention time. " The patterns of information are reproducible for every mixture, and therefore make it possible to identify the mixture. A chromatogram is the pattern formed by the separation of the components of a sample of debris, with the abundance appearing on the vertical axis and the retention times appearing on the horizontal axis of the graph.
12. The 1986 Report identified the chromatographic data as Source Sample Test Date
 - a. Laboratory Standard Amoco Gasoline STD 05 / 26 / 86
 - b. Laboratory Standard Amoco Gasoline STD 05 / 27 / 96
 - c. Laboratory Standard Paint Thinner STD 04 / 02 / 86

- d. Living Room Sample 4, Carpet 07 / 23/ 86
- e. Living Room' Sample 4, Carpet Rerun 0? / 25 / 86
- f. Living Room Sample 5, Carpet 07 / 23 / 86
- g. Living room Sub Floor Sample 6, Concrete Chips no data

13. Of the five samples, the Ohio Arson Crime Laboratory identified only three that were positive for accelerants. Sample 7 (Trial Exhibit No. 51) and Sample 4 (Trial Exhibit No. 49) were identified at trial as revealing the presence of paint thinner. Exhibit B; Transcript of Proceedings, State v. Richey, Case No. CR86-21 (Trial Trans.), Dan Gelfius testimony, at 836. Sample 5 (Trial Exhibit No. 50) was identified at trial as revealing the presence of gasoline. Exhibit B; Trial Trans., Dan Gelfius testimony, at 836.

OPINION

14. Using the available reference data (the gasoline and paint thinner standards), I have formed the following opinions. These conclusions are based on sound scientific principles used in the forensic science community for the interpretation of gas chromatographic data. After analyzing the available data using the best scientific standards that were available in 1986, and those standards which are currently acceptable, it is my opinion that there is no evidence of an identifiable ignitable liquid in any of the samples from the fire scene. I first summarize my opinions, and then provided a fuller explanation.

- a. Sample No. 7 is negative for identifiable ignitable liquids. Paint thinner cannot be identified in the recovery based either on the 1986 standards used by the Ohio Arson Crime Laboratory or current scientific criteria.
- b. Sample No. 5 should be reported as negative for identifiable ignitable liquids based on the current scientific criteria. These scientific criteria were available in 1986 and were used by chromatography experts, including myself.
- c. Sample 4 also cannot be identified as paint thinner. The recovery in Sample 4 is more consistent with ordinary household products, such as furniture polish or insecticides.
- d. The recovery in Sample 7 and Sample 4 are not the same substance.
- e. The Ohio Arson Crime Laboratory used poor analytical procedures, even when measured according to their own criteria.
- f. Gregory DuBois' actions fell below a minimal standard professional competency.

15. I was working professionally in the field of forensic science including testing on the detection and identification of flammable liquids in suspect fire debris, in 1986. If Richey's defense counsel had contacted me in 1986, I would have offered the same opinions at trial that I am offering herein.

16. Sample 7 does not contain an identifiable ignitable liquid.

- a. The relative retention times of the various components of sample 7 do not correspond to the relative retention times of the various components of the paint thinner standard contained in the 1986 Report.
- b. The major components of paint thinner are five normal alkanes. Paint thinner is identified by the characteristic pattern of evaporation of the five normal alkanes. This characteristic pattern does not appear in Sample.

- c. Based on the available data, paint thinner cannot be identified in Sample 7.
 - d. Wood that is used construct patio, such as pine, naturally contain turpentine. The various components of Sample 7 correspond to naturally occurring turpentine in wood. There is a reasonable probability that the substance detected from Sample 7 is a turpentine that is indigenous to the wood used to construct the patio deck.
17. Sample 5 should be reported as negative for identifiable flammable liquids.
- a. Under current American Society of Testing Materials (ASTM) criteria, gasoline is identified by a "five peak component" pattern. This standard was not required by the ASTM until 1989, but professionals utilizing chromatography knew and used the "five peak component" pattern standard in 1986 to identify gasoline. I used the "five peak component" pattern in 1986 to identify gasoline.
 - b. The "five peak component" pattern is demonstrated in Figure 4 of Exhibit C, attached hereto. The gasoline standard in Figure 4, Exhibit C is from ASTM Publication E1387-94.
 - c. The "five peak component" pattern is not identifiable in Sample 5. Therefore, Sample S should be reported as negative for identifiable flammable liquids based on the current ASTM criteria.
 - d. The 1986 Report used a gasoline standard that did not display the "five peak component" pattern. The "five peak component" pattern standard is superior to the criteria used by the Ohio Arson Crime Laboratory because it provides greater resolution (sharpness of peaks) to separate the components of gasoline. A laboratory must have the proper equipment to obtain the resolution necessary to identify the "five peak component" pattern. Thus, the scientific quality of a laboratory's analytical technique is tied directly to the equipment the laboratory utilizes. The equipment necessary to obtain resolution sufficient to identify the "five peak component" pattern was readily available, and used by other laboratories in 1986. Therefore Sample S should be reported as negative for identifiable flammable liquids based on current scientific criteria, which were widely used by experts in the field in 1986 and were available and utilized as early as 1975.
 - e. Moreover, Sample 5 is not even consistent with the gasoline standard utilized by the Ohio Arson Crime Laboratory. As stated in paragraph 11 above, the characteristic pattern that a substance displays when it is analyzed through chromatography is extremely reproducible. The abundance and relative retention times of a substance should appear in the same unique pattern each time a laboratory tests that substance. Even under the standards employed by the Ohio Arson Crime Laboratory, the relative retention times of Sample 5 are off by 15 to 20 seconds from the relative retention times of the gasoline standard. This difference is not a scientifically acceptable divergence. Even according to the criteria used by the Ohio Arson Crime Laboratory, the 1986 Report should have stated that Sample 5 did not correspond to the gasoline standard.
 - f. Even if one is willing to assume that this 15 to 20 second difference in relative retention times is a scientifically acceptable divergence, the 1986 Report should have stated that the recovery in Sample 5 is consistent only with a low level of evaporated gasoline. Sample 5 does correspond slightly to the gasoline standard provided in the 1986 Report. Assuming the reproducibility of the equipment, Sample S demonstrates a lack of structure at the front of the sample chromatogram. The lack of structure means that, if Sample 5 is gasoline, it is evaporated gasoline. It is impossible to determine whether the gasoline was placed on the carpet before the June 30, 1986 fire or after the carpet was removed from Hope Collins' apartment.
18. Sample 4 does not contain an identifiable ignitable liquid.
- a. The re-run chromatogram for Sample 4 is inconsistent with the paint thinner standard included in the 1986 report. Sample 4 shows the first major peak on the right-hand side of the graph going off-scale, followed by two big peaks to the left that also go off-scale. The paint thinner standard does not contain this pattern. Therefore, Sample 4 cannot be positively identified as paint thinner.

- b. Sample 4 contains a low level of a medium petroleum distillate. This range of recovery is typical for common insecticide solvents, some lamp oils, furniture polishes, glues, and petroleum naphthas. The petroleum naphthas may be used as thinners for oil based paints.
 - c. However, Sample 4 does not contain the five normal alkanes that are the characteristic components of a paint thinner. Therefore, the Ohio ' Arson Crime Laboratory was incorrect in positively identifying Sample 4 as containing evidence of paint thinner. Sample 4 may show four normal alkanes. The pattern of four normal alkanes is not sufficient to specifically identify an ignitable liquid. This type of product is characteristic of common household products, such as furniture polish or insecticides.
19. Sample 7 and Sample 4 do not contain the same substances.
- a. The relative intensity of the branched hydrocarbons from the recovery from Sample 4 do not correspond to the pattern of information from Sample 7.
 - b. In simpler language, at least two of the peaks in Sample 7 are bi-cuspid. These two peaks are in the seventh and eleventh columns counting in from the left side of the graph. These bi-cuspid peaks are distinctive. They are characteristic of turpentine, indigenous to wood. None of the peaks from Sample 4 contains this distinctive bi-cuspid pattern. Rather, all of the peaks from Sample 4 are "singlets".
 - c. Therefore, the lack of bi-cuspid peaks from Sample 4 necessarily means that the recovery from Sample 7 and Sample 4 are not the same substance.
20. The Ohio Arson Crime Laboratory used poor analytical procedures.
- a. A chromatography laboratory's results are scientifically reliable only if its equipment is extremely reproducible, meaning that it can reproduce the abundance and relative retention times of a substance. The 1986 Report contains two instances where the relative retention times of a sample of debris do not correspond to the relative retention times of the control standard. The relative retention times of Sample 7 do not correspond to the relative retention times of paint thinner control standard. Likewise, the relative retention times of Sample 5 do not correspond to the relative retention times of the gasoline control standard. If the Ohio Arson Crime Laboratory's equipment was extremely reproducible, then Sample 7 cannot be paint thinner and Sample 5 cannot be gasoline. If the equipment was not extremely reproducible, then none of the results reported by the Ohio Arson Crime Laboratory are reliable. The Ohio Arson Crime Laboratory used sloppy analytical technique when its scientists reported that Samples 7 and 5 corresponded to the respective control standards, even though the relative retention times varied significantly.
 - b. The Ohio Laboratory did not supply the "blanks" in the analytical data. It is proper scientific technique to supply the "blanks" to show that the solvent in which the sample was immersed was clean. Otherwise, the solvent could have been contaminated. The contaminant could show up as a positive result for an ignitable liquid from an otherwise clean sample.
 - c. The Ohio Laboratory did not use timely standards. The paint thinner standard is dated April 2, 1986, and the gasoline standard is dated April 9, 1986. However, Samples 4, 5 and 7 were not run until July 1986, almost four months after the standards were run. This interval is unreasonable because the calibration of the column of the chromatograph would not be reproducible or the flow-rate on the chromatograph could have changed. Especially for testing gasoline, the longest interval that should occur between the standard and the sample testings is less than two weeks. The Ohio Arson Crime Laboratory also did not provide daily operation standards to show that the equipment was working properly. Therefore, the unreasonably long interval between the time when the standards were run and when the samples were run invalidates the test results on scientific principles of reproducibility

21. DuBois actions fell below the minimum standard of professional competency.
- a. DuBois failed to render competent expert assistance for at least four reasons.
 - b. First, the minimal standard of professional competency for an expert who is rendering an opinion as to whether there are ignitable liquids present in a sample of debris requires the expert to have the samples independently evaluated, if possible. In the present case, DuBois should have conducted, in a timely manner, his own independent testing on the samples of debris collected by Cryer, rather than merely relying on the data obtained by the Ohio Arson Crime Laboratory. DuBois did not do this.
 - c. Second, irrespective of the issue of independent testing, any reasonably competent expert would have concluded in accordance with the dictates of sound scientific principles that the recovery obtained from Sample 5 could not be positively identified as gasoline from the fire scene. Likewise, a competent expert would have concluded in accordance with the dictates of sound scientific principles that the recoveries obtained from Samples 4 and 7 were not paint thinner and, moreover, were not even the same substance. DuBois's actions fell below the minimum standard of professional competency because he testified that he did not see any evidence to indicate that Samples 4 and 7 did not contain paint thinner, that Samples 4 and 7 were not the same substance, and that Sample 5 did not contain gasoline from the fire scene.
 - d. Third, any expert qualified to render an opinion regarding chromatographic data would have concluded that the results of the conducted by the Ohio Arson Crime Laboratory were inherently scientifically unreliable because the Ohio Arson Crime Laboratory used poor analytical techniques. DuBois' testimony fell below the minimum standard of professional competency because he concurred with the conclusions of the Ohio Arson Crime Laboratory, which conclusions were based on faulty scientific techniques.
 - e. Fourth, any reasonably competent expert would have known that Sample 5 should be reported as negative for identifiable flammable liquids from the fire scene, not only because the Ohio Arson Crime Laboratory used an incorrect standard, but also because it is impossible to form an opinion to a reasonable degree of scientific certainty regarding data taken from contaminated evidence. Sample 5 was not taken from the living room carpet until after the carpet had been removed from beneath a pile of garbage in a dump site and subsequently removed to a sheriff's department parking lot. At the sheriff's department parking lot, the carpet was laid out on the ground, in direct contact with asphalt. For this reason, the Ohio Arson Crime Laboratory and any expert qualified to render an opinion regarding the presence of gasoline in Sample 5 should have treated the data obtained from Sample 5 as inconclusive at best. Because the evidence from which Sample S was obtained was contaminated, even if the sample had been positive for gasoline, there would be no way to determine whether the source of the recovery from the carpet, Sample 5, was the scene of the June 30, 1986 fire, the garbage at the dump site or the sheriff's department parking lot. DuBois' actions feel below the minimum standard of professional competency because he testified that he could render an opinion concerning whether a sample from the contaminated carpet contained an accelerant, rather than testifying that any results from testing on Sample 5 were inherently scientifically unreliable due to the contamination through improper care, custody and control, and sampling methods.

SWORN UNDER THE PAINS AND PENALTIES OF PERJURY this 26th day of April, 1996.

Andrew T. Armstrong, Ph. D.

STATE OF TEXAS COUNTY OF TARRANT

On the 26th day of April, 1996, before me personally appeared Andrew T. Armstrong, Ph. D., to me known, and acknowledged that his execution of the foregoing is his free act and deed.

Signature

NOTARY PUBLIC

My commission expires : 02 / 14 / 2000

February 14, 2000