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OFFICE OF THE STATE ATTORNEY, NINTH JUDICIAL CIRCUIT
RECEIPT FOR DISCOVERY DISCLOSURE

DEFENDANT: CASEY MARIE ANTHONY

CASE NO. : 48-2008-CF-010925-O

DIVISION: 16

ASA: Linda Drane Burdick

I HEREBY CERTIFY that the following listed items for the above listed case was received by the office of Jose A. Baez on this 20th day of October, 2008.

1. FBI Report of examination dated August 1, 2008 (3 pages)
2. FBI Report of examination dated August 6, 2008 (2 pages)
3. FBI Report of examination dated August 8, 2008 (3 pages)
4. FBI Report of examination dated August 13, 2008 (3 pages)
5. FBI Report of examination dated September 8, 2008 (2 pages)
6. FBI Report of examination dated September 12, 2008 (2 pages))
7. FBI Report of examination dated September 19, 2008 (2 pages)
8. FBI Report of examination dated September 24, 2008 (2 pages)
9. Oak Ridge National Laboratory Preliminary Report #2 dated September 24, 2008 (15 Pages)

PRINT NAME: _____

SIGNATURE: _____

SAO copy



FBI Laboratory

2501 Investigation Parkway
Quantico, Virginia 22135

REPORT OF EXAMINATION

To: Tampa
Orlando RA
TFO John Steven McElyea

Date: August 1, 2008

Case ID No.: 7A-TP-71176

Lab No.: 080730003 TO LF

Reference: Communication dated July 28, 2008

Your No.:

Title: CAYLEE MARIE ANTHONY - VICTIM
MISSING / ABDUCTED MINOR
ORANGE COUNTY, FLORIDA

Date specimens received: July 30, 2008

The following items were received in the Trace Evidence Unit (Hair and Fiber):

ITEMS FROM VEHICLE - FLORIDA TAG # G63 XV

- Q1 Debris from front edge of trunk (Item Q-1)
- Q2 Debris from interior trunk floor (Item Q-2)
- Q3 Debris from right side interior fender well (Item Q-3)
- Q4 Debris from spare tire cover (Item Q-4)
- Q5 Debris from spare tire cover (Item Q-5)
- Q6 Debris from right side of trunk liner (Item Q-6)
- Q7 Debris from middle of the trunk liner (Item Q-7)

- Q8 Debris from left side of trunk liner (Item Q-8)
- Q9 Debris from left side of trunk liner (Item Q-9)
- Q10 Debris from left side of trunk liner (Item Q-10)
- Q11 Debris from left directional wire (Item Q-11)
- Q12 Debris from left side of trunk liner (Item Q-12)
- Q12.1 Hair from specimen Q12 debris from left side of trunk liner

ITEMS LISTED AS BELONGING TO VICTIM - CAYLEE MARIE ANTHONY

- Q15 Hairbrush (Item K-3)
- Q16 Comb (Item K-4)

K2 Head hair sample from CASEY ANTHONY (Items K-8 and K-9)

The results of the trace evidence examinations (hair and fiber) are included in this report.

Results of examinations:

A Caucasian head hair found in specimen Q12 exhibits characteristics of apparent decomposition at the proximal (root) end. This hair is microscopically similar to the Caucasian head hair recovered from the Q15 hairbrush, however a more meaningful conclusion can not be reached as this is not a suitable known hair sample. The proximal (root) portion of the hair, which exhibits the apparent decomposition has been preserved on a glass microscope slide. The remainder of the hair, designated Q12.1, has been submitted for mitochondrial DNA analysis.

No other hairs exhibiting characteristics of apparent decomposition were found in specimens Q1 through Q7 and Q10 through Q12. No hairs were found in specimens Q8 and Q9.

Due to the circumstances of the case, no other trace evidence examinations were conducted.

The specimens were examined visually using stereo-microscopy and comparison microscopy.

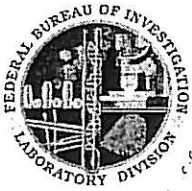
Remarks:

For questions about the content of this report, please contact Forensic Examiner Karen Korsberg Lowe at ([REDACTED]). For questions about the status of remaining forensic examinations, please contact Request Coordinator Erin Martin at [REDACTED].

The submitted items will be returned under separate cover at the completion of the laboratory examinations.

Karen Korsberg Lowe
Trace Evidence Unit

This report contains the opinions/interpretations of the examiner(s) who issued the report.



FBI Laboratory

2501 Investigation Parkway
Quantico, Virginia 22135

REPORT OF EXAMINATION

To: Tampa
Orlando RA
SA Nickolas B. Savage
TFO John Steven McElyea

Date: August 6, 2008

Case ID No.: 7A-TP-71176

Lab No.: 080805005 TO LF

Reference: Communication dated August 4, 2008

Your No.:

Title: CAYLEE MARIE ANTHONY - VICTIM
MISSING / ABDUCTED MINOR
ORANGE COUNTY, FLORIDA

Date specimens received: August 5, 2008

The following items were examined in the Trace Evidence Unit (Hair and Fiber):

ITEMS FROM VEHICLE - FLORIDA TAG # G63 XV

- Q22 Piece of spare tire cover (OCSO Item #22, Q-18)
- Q23 Spare tire cover (OCSO Item #26, Q-21)
- Q24 Left side of trunk liner (OCSO Item #25, Q-20)
- Q25 Right side of trunk liner (OCSO Item #24, Q-19)
- Q26 Debris from trunk (OCSO Item #1, Q-14)
- Q27 Debris from inside trunk (OCSO Item #3, Q-15)
- Q28 Debris from trunk interior and fender well interior (OCSO Item #6, Q-17)

The results of the trace evidence examinations (hair and fiber) are included in this report.

This report supplements the FBI Laboratory report to your office dated August 1, 2008 (FBI Laboratory number 080730003 TO LF).

Results of examinations:

Specimens Q22 through Q25 and debris collected from specimens Q26 through Q28 were examined for the presence of hairs exhibiting characteristics of apparent decomposition; however none were found.

Hairs and fibers collected from specimens Q23 through Q28 have been preserved on glass microscope slides and in vacuum canisters for possible future comparisons.

The specimens were examined visually using stereo-microscopy and comparison microscopy.

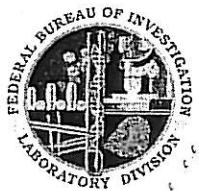
Remarks:

For questions about the content of this report, please contact Forensic Examiner Karen Korsberg Lowe at [REDACTED]. For questions about the status of remaining forensic examinations, please contact Request Coordinator Erin Martin at [REDACTED].

The submitted items will be returned under separate cover at the completion of the laboratory examinations.

Karen Korsberg Lowe
Trace Evidence Unit

This report contains the opinions/interpretations of the examiner(s) who issued the report.

**FBI Laboratory**2501 Investigation Parkway
Quantico, Virginia 22135**REPORT OF EXAMINATION**To: Tampa
Orlando RA
TFO John Steven McElyea

Date: August 8, 2008

Case ID No.: 7A-TP-71176

Lab No.: 080730003 TO MQ

Reference: Communication dated July 28, 2008

Your No.:

Title: CAYLEE MARIE ANTHONY - VICTIM
MISSING / ABDUCTED MINOR
ORANGE COUNTY, FLORIDA

Date specimens received: July 30, 2008

The items listed below were examined in the DNA Analysis Unit II:

Q12.1 Hair from specimen Q12 debris from left side of trunk liner

K1 Buccal sample from CASEY ANTHONY (Items K-6 and K-7)

This report contains the results of the mitochondrial DNA (mtDNA) examinations.

Results of Examinations:

Mitochondrial DNA (mtDNA) sequences were obtained from the Q12.1 from the hair from the Q12 debris from the left side of the trunk liner and the K1 buccal sample identified as coming from CASEY ANTHONY, identified as the mother of CAYLEE MARIE ANTHONY. The mtDNA sequences obtained from items Q12.1 and K1 are the same. Therefore, neither CASEY ANTHONY nor CAYLEE MARIE ANTHONY can be excluded as the source of the Q12.1 hair.

Using the mtDNA population database currently available to the FBI Laboratory (CODIS + mito Popstats v.1.4, 5071 v.4, containing 5071 individuals, searching positions 16024-16365 and 73-340), the mtDNA sequence obtained from items Q12.1 and K1 has been observed as follows:

Database	Number of Observations	Individuals in Database	Upper Bound Frequency Estimate
African-American	0	1148	0.26%
Caucasian	24	1814	1.85%
Hispanic	1	759	0.39%

The mtDNA sequencing results are detailed below. Results are listed as differences from the published revised Cambridge Reference Sequence.

Specimen	Q12.1 hair	K1 Casey Anthony
Range	np 15998-16390	np 15998-16390
HVI	16126 C 16294 T 16296 T 16304 C	16126 C 16294 T 16296 T 16304 C
Range	np 49-408	49-408
HVII	73 G 263 G 309.1 C 315.1 C	73 G 263 G 309.1 C* 315.1 C *C8TC6-major C9TC6

No other mtDNA examinations were conducted.

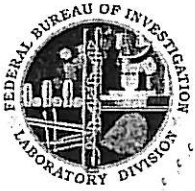
Remarks:

The submitted items will be returned under separate cover along with the processed DNA generated from the mtDNA examinations. The processed DNA can be found in a package marked PROCESSED DNA SAMPLES: SHOULD BE REFRIGERATED/FROZEN. It is recommended that these samples be stored in a refrigerator/freezer and isolated from evidence that has not been examined.

For questions about the content of this report, please contact examiner Catherine E. Theisen at [REDACTED]. For questions about the status of remaining examinations, please contact Request Coordinator Erin Martin at [REDACTED].

Catherine E. Theisen, PhD
DNA Analysis Unit II

This report contains the opinions/interpretations of the examiner(s) who issued the report.



FBI Laboratory

2501 Investigation Parkway
Quantico, Virginia 22135

REPORT OF EXAMINATION

To: Tampa
SA Nicholas B. Savage

Date: August 13, 2008

Case ID No.: 7A-TP-71176

Lab No.: 080811005 TO LF
080811006 TO LF

Reference: Communications dated August 8, 2008

Your No.:

Title: CAYLEE MARIE ANTHONY - VICTIM
MISSING/ ABDUCTED MINOR
ORANGE COUNTY, FLORIDA

Date specimens received: August 11, 2008

The following items were received in the Trace Evidence Unit (Hair and Fiber) (FBI Laboratory number 080811005 TO LF):

ITEMS FROM CLOSET OF EAST ROOM OF 4937 HOPE SPRING DRIVE

- Q33 Pants (OSCO Item #1, Q-25)
- Q34 Pants (OSCO Item #10, Q-34)
- Q35 Pants (OSCO Item #11, Q-35)
- Q36 Skirt (OSCO Item #2, Q-26)
- Q37 Skirt (OSCO Item #8, Q-32)
- Q38 Skirt (OSCO Item #9, Q-33)
- Q39 Shirt (OSCO Item #3, Q-27)

- Q40 Shirt (OSCO Item #4, Q-28)
- Q41 Shirt (OSCO Item #5, Q-29)
- Q42 Shirt (OSCO Item #6, Q-30)
- Q43 Shirt (OSCO Item #7, Q-31)

The following items were received in the Trace Evidence Unit (Hair and Fiber) (FBI Laboratory number 080811006 TO LF):

ITEMS FROM VEHICLE - FLORIDA TAG # G63 XV

- Q44 Piece of spare tire cover (OCSO Item # 2, Q-16)
- Q45 Piece of spare tire cover (OCSO Item # 31, Q-24)

The results of the trace evidence examinations (hair and fiber) are included in this report.

Results of examinations:

Specimens Q33 through Q43 (FBI Laboratory number 080811005 TO LF), Q44 and Q45 (FBI Laboratory number 080811006 TO LF) were examined for the presence of hairs exhibiting characteristics of apparent decomposition; however, none were found.

Due to the circumstances of the case, no other hair and fiber examinations were conducted.

The specimens were examined visually using stereo-microscopy and comparison microscopy.

Remarks:

For questions about the content of this report, please contact Forensic Examiner Karen Korsberg Lowe at [REDACTED]. For questions about the status of remaining forensic examinations, please contact Request Coordinator Erin Martin at [REDACTED].

The submitted items will be returned under separate cover at the completion of the laboratory examinations.

Karen Korsberg Lowe
Trace Evidence Unit

This report contains the opinions/interpretations of the examiner(s) who issued the report.

To: Tampa
Orlando RA
SA Nickolas B. Savage
TFO John Steven McElyea

Date: September 08, 2008

Case ID No.: 7A-TP-71176

Lab No.: 080805005 TO LH
080811006 TO LH

Reference: Communications dated August 04, 2008 and August 08, 2008

Your No.:

Title: CAYLEE MARIE ANTHONY - VICTIM
MISSING / ABDUCTED MINOR
ORANGE COUNTY, FLORIDA

Date specimens received: August 05, 2008 and August 11, 2008

The items listed below were submitted under cover of communication dated August 04, 2008, assigned Laboratory Number 080805005, and examined in the Chemistry Unit:

- Q22 Piece of spare tire cover (OCSO Item #22, Q-18)
- Q23 Spare tire cover (OCSO Item #26, Q-21)
- Q24 Left side of trunk liner (OCSO Item #25, Q-20)
- Q25 Right side of trunk liner (OCSO Item #24, Q-19)

The items listed below were submitted under cover of communication dated August 08, 2008, assigned Laboratory Number 080811006, and examined in the Chemistry Unit:

- Q44 Piece of spare tire cover (OCSO Item # 2, Q-16)

Q45 This report contains the opinions/interpretations of the Examiner who issued the report.
Piece of spare tire cover (OCSO Item # 31, Q-24)

Page 1 of 2
080805005 TO LH
~~080811006~~ TO LH

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This report contains the results of the chemical examinations.

Results of Examinations:

Residues of chloroform were identified within the specimens Q22, Q23, Q44, and Q45. Residues consistent with chloroform were detected within specimens Q24 and Q25. No additional chemicals (e.g., acetone or alcohols) were identified within the examined specimens.

The following techniques were used in the examination of the specimens: visual inspection, alternate light source visualization, headspace-gas chromatography, and headspace-gas chromatography/mass spectrometry.

Remarks:

A final disposition will be the subject of a separate communication.

For questions regarding the content of this report, please contact Examiner Michael Rickenbach at [REDACTED]

For questions regarding the status of remaining forensic examinations, please contact Request Coordinator Erin Martin at [REDACTED]

Michael P. Rickenbach
Chemistry Unit

This report contains the opinions/interpretations of the Examiner who issued the report.

Page 2 of 2
080805005 TO LH
080811006 TO LH

For Official Use Only

**FBI Laboratory**2501 Investigation Parkway
Quantico, Virginia 22135**REPORT OF EXAMINATION**

To: Tampa
Orlando RA
SA Nickolas B. Savage
TFO John Steven McElyea

Date: September 12, 2008

Case ID No.: 7A-TP-71176

Lab No.: 080911006 TO HL

Reference: Communication dated September 10, 2008

Your No.:

Title: CAYLEE MARIE ANTHONY - VICTIM
MISSING / ABDUCTED MINOR
ORANGE COUNTY, FLORIDA

Date specimens received: September 11, 2008

The following specimens were examined in the Trace Evidence Unit for hairs and fibers:

- Q46 Shovel (OCSO Item # 1, K-11)
- Q46.1 Label from the blade of the Q46 shovel (OCSO Item # 1, K-11)
- Q46.2 Hair from Q46 shovel (OCSO Item # 1, K-11)

This report contains the results of the Trace Evidence (hair and fiber) examinations.

Results of Examinations:

One small hair fragment (less than 1/4 inch long) exhibiting Caucasian characteristics was recovered from the label adhering to the lower portion of the handle of the Q46 shovel. This hair is too limited to be of value for meaningful microscopic comparison purposes. This hair has been designated as specimen Q46.2 and submitted for mitochondrial DNA analysis.

No other hairs and no fibers were observed on the Q46 shovel, the labels adhering to the handle of the Q46 shovel, or the label removed from the blade of the shovel, specimen Q46.1.

The specimens were examined visually using stereo-microscopy and comparison microscopy.

Remarks:

For questions about the content of this report, please contact Supervisory Physical Scientist Cary T. Oien at [REDACTED].

For questions about the status of remaining forensic examinations, please contact Request Coordinator Erin Martin at [REDACTED].

The submitted items will be returned at the completion of the requested examinations.

Cary T. Oien
Trace Evidence Unit

This report contains the opinions/interpretations of the examiner(s) who issued the report.

fact

RA
Nicolas B. Savage
in Steven McElyea

Date: September 19, 2008

Case ID No.: 7A-TP-71176

Lab No.: 080911006 TO ABA

Communication dated September 10, 2008

LEE MARIE ANTHONY - VICTIM
SING / ABDUCTED MINOR
ANGE COUNTY, FLORIDA

received: September 11, 2008

and below were examined in the Latent Print Operations Unit:

Shovel (OCSO Item # 1, K-11)

Shovel from Q46 shovel blade (OCSO Item # 1, K-11)

being issued by the Latent Print Operations Unit.

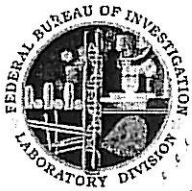
Examinations:

Requested latent print examinations were conducted, but no latent prints of value

For questions about the content of this report, please contact Physical
Science Examiner Elizabeth K. Fontaine at [REDACTED]

ABA

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FBI Laboratory

2501 Investigation Parkway
Quantico, Virginia 22135

REPORT OF EXAMINATION

To: Tampa
Orlando RA
SA Nickolas B. Savage
TFO John Steven McElyea

Date: September 24, 2008

Case ID No.: 7A-TP-71176

Lab No.: 080911006 TO MQ

Reference: Communication dated September 10, 2008

Your No.:

Title: CAYLEE MARIE ANTHONY - VICTIM
MISSING / ABDUCTED MINOR
ORANGE COUNTY, FLORIDA

Date specimens received: September 11, 2008

The items listed below were examined in the DNA Analysis Unit II:

Q46.2 Hair from Q46 shovel (OCSO Item # 1, K-11)

This report contains the results of the mitochondrial DNA (mtDNA) examinations.

Results of Examinations:

A mitochondrial DNA (mtDNA) sequence was obtained from the Q46.2 hair from the shovel. This sequence was compared with the mtDNA sequence from the K1 buccal sample identified as coming from CASEY ANTHONY, identified as the mother of CAYLEE MARIE ANTHONY (FBI Laboratory Number 080730003, FBI Laboratory report dated August 8, 2008). The mtDNA sequences obtained from items Q46.2 and K1 are different. Therefore, both CASEY ANTHONY and CAYLEE MARIE ANTHONY can be excluded as the source of the Q46.2 hair.

The mtDNA sequencing results are detailed below. Results are listed as differences from the published revised Cambridge Reference Sequence (rCRS).

Specimen	Q46.2 hair Lab # 080911006	K1 Casey Anthony Lab # 080730003
Range	np 15998-16390	np 15998-16390
	same as rCRS	16304 C
Range	np 49-408	49-408
HVII	263 G 315.1 C	73 G 263 G 309.1 C* 315.1 C *C8TC6-major C9TC6

No other mtDNA examinations were conducted.

Remarks:

The Q46.2 hair was consumed during analysis. The remainder of the submitted items will be returned under separate cover along with the processed DNA generated from the mtDNA examinations. The processed DNA can be found in a package marked PROCESSED DNA SAMPLES: SHOULD BE REFRIGERATED/FROZEN. It is recommended that these samples be stored in a refrigerator/freezer and isolated from evidence that has not been examined.

For questions about the content of this report, please contact examiner Catherine E. Theisen at [REDACTED]. For questions about the status of remaining examinations, please contact Request Coordinator Erin Martin at [REDACTED].

Catherine E. Theisen, PhD
DNA Analysis Unit II

This report contains the opinions/interpretations of the examiner(s) who issued the report.

FORENSIC REPORT
Orange County, Orlando, Florida
Preliminary Report #2

TO: Detective Yuri Melich, Orange County Sheriff's Dept, Orlando, Florida
Investigator Mike Vincent, Orange County Sheriff's Dept, Orlando, Florida

FROM: Arpad Vass, Ph.D., Research Scientist, Oak Ridge National Laboratory, Oak Ridge, TN.
Marc Wise, Ph.D. Analytical Chemist, Oak Ridge National Laboratory, Oak Ridge, TN.
Madhavi Martin, Ph.D., Staff Research Scientist, Physicist, Oak Ridge National Laboratory, Oak Ridge, TN.

SUBJECT: Orange County Sheriff's Department case number OCSO#08-069208.
Preliminary results of various tests to determine the possibility of a decompositional event.

DATE: September 24, 2008

On July 24, 2008 Investigator Mike Vincent of the Orange County Sheriff's Department sent us a carpet sample from the trunk of a 1998 Pontiac Sunfire (FL License number G63-XV) to determine if the odor present on the sample and in the trunk of the vehicle was indicative of a decompositional event. Additional air samples, collected by Investigator Vincent on triple sorbent traps (TSTs), were sent to us on September 3, 2008 and included air samples from the vehicle interior and composite air samples from all the items identified in the trunk compartment. These samples were sent to us in reference to research we have been performing since 2002 in an attempt to identify the chemical composition of human decomposition odor. This research has resulted in the development of a Decompositional Odor Analysis database (References 1-2).

Odor Analysis

The initial carpet sample was enclosed in a sealed metal can. A preliminary analysis was performed by collecting a small (0.8 ml) sample of air from the can and injecting the air into a gas chromatograph/mass spectrometer. Several compounds were observed in this sample (primarily chloroform); however, it was deemed necessary to concentrate the sample in order improve the sensitivity for the lower abundance compounds.

The sample was removed from the metal can and placed in a Tedlar bag for several days at 35 degrees C and allowed to off-gas into the Tedlar bag. The analytes from several ml of gas from the Tedlar bag were concentrated by cryo-focusing them with liquid nitrogen at the head of a gas chromatograph/mass spectrometer. Preliminary results of this analysis are summarized in Table 1. Compounds in the sample were tentatively identified by mass spectral library match. Standards of the tentatively identified compounds have not yet been run. It is important to note that gasoline was found in the vehicle trunk which presented a significant chromatographic signal and overlapped with approximately 41% of the chemicals typically observed in decompositional events.

Previous reports of a decomposing pizza found in the vehicle trunk were not true and this was incorrectly stated in the previous report. An MSDS sheet, listing the ingredients of BlueStar, was obtained and evaluated by a chemist (Dr. Michael Burnett, Oak Ridge National Laboratory). His conclusion was that the components of the product could not have contributed to the chemical signature obtained in these analyses. Additional samples which have been analyzed and are being summarized in this report include:

- 1) control trunk carpet sections obtained from three Pontiac Sunfire vehicles (two from 1998 and one from 1996 – the carpet samples were all a similar color and type as the Florida vehicle) located in a junkyard in Knoxville, TN and placed in a Tedlar bag at 35 degrees C for two days (collected by Dr. David Glasgow, ORNL);
- 2) a piece of pizza (mushroom and pepperoni) in the original pizza box which was allowed to decompose for several days at the University of Tennessee's Decay Research Facility and then placed in a Tedlar bag at 35 degrees C (included as a control even though no pizza was actually found in the Florida vehicle). It is interesting to note that no maggots were found on the pizza;
- 3) composite air samples of all the items found in the trunk of the Florida vehicle collected on triple sorbent traps (TSTs),
- 4) air samples from the Florida vehicle interior compartment collected on TSTs,
- 5) Laser Induced Breakdown Spectroscopy (LIBS) results from the Florida trunk sample,
- 6) air from the laboratory at ORNL where the Florida trunk carpet sample was prepared and stored (control);
- 7) TST Florida trip blank (control);
- 8) TST air sample from garage where Florida vehicle is stored (control);
- 9) Volatile fatty acid analysis (not yet complete) which will also be used to assist in the determination of a decompositional event and is the best means of obtaining a post-mortem interval (PMI) in this instance in lieu of entomological evidence.

Of the 51 chemicals identified from the Florida trunk carpet sample, (many gasoline components detected are not listed in the Table), 41 (80%) are consistent with decompositional events. Only seventeen of these overlap with known or possible gasoline constituents leaving 24 compounds (59 %) found in the decompositional odor analysis database potentially unaccounted for. It is important to note that this sample was removed from the trunk and eventually isolated in a Tedlar bag so the compounds which were detected in this analysis were off-gassing from the carpet sample and did not include vapors that may be in the air of the trunk.

Nine compounds identified in the control carpet samples from the junkyard were also detected in the Florida trunk carpet samples. These were all in trace amounts. Only four of these could not be attributed to possible gasoline vapor components – one of these compounds was chloroform, but was only detected in trace amounts in the control carpet sample.

Only six compounds identified in the pizza, which were also detected in the Florida trunk sample, could not be attributed to gasoline vapor components. Of these six compounds, four were detected in the control carpet samples from the junkyard.

Laboratory air where the sample was stored and processed was sampled to determine if the room contained any chemical components which might have contributed to the odor detected in the Florida trunk carpet sample. None were detected.

The TST trip blank contained a number of additional compounds unrelated to what was found in the Florida car trunk. In order to keep Table 1 as simple as possible not all compounds are listed, but some of the additional compounds detected in this sample included: butane, 2-butene, 2-methyl butane, 1-pentene, 1-hexene, pentanal, 1-heptene, heptane, 1-octene, heptanal and substituted benzenes.

The Florida Forensics Unit Garage TST air sample was composed of primarily gasoline vapors (not all components listed in Table 1), freons and degreasers (tetrachloroethene), all commonly found in garages. No chloroform or sulfur containing compounds were detected in spite of the fact that TSTs could potentially concentrate more material than would direct sampling of the headspace of the carpet sample in a Tedlar bag (10 mLs were injected). The TST pump was calibrated to collect 500mL/minute and 77 minutes were collected so the spectrum would have represented approximately 39 L of air. Freons detected included trichlorofluoromethane, dichlorofluoroethane and trichlorotrifluoroethane. Some of the additional compounds detected in this sample included: 2-methyl butane, 2-methyl butene, 2,3 dimethyl butane, 2-methyl pentane, cyclohexane, methyl cyclopentane, 3-methyl hexane, cyclopentane, heptane, 3-methyl 2-hexane, methylcyclohexane, 1,2 dimethyl benzene (xylenes) and styrene.

The TST air sampling from the Florida vehicle interior showed common hydrocarbons and significant amounts of xylenes present [69 minutes collection time (34.5 L of air)]. Not all compounds are listed in Table 1. Some additional compounds detected in this sample included: substituted benzenes, pentanes, heptanes, heptenes and 2-propanol.

The composite air sampling of the trash bag contents [72 minutes collection time (36 L of air)] showed that compounds were present which represented primarily ubiquitous hydrocarbons, many of which are also found in gasoline (not all listed in Table 1). Dichlorofluoroethane and tetrachloroethene (also seen in the garage air sample) were detected in low concentrations. Some of the additional compounds detected in this sample include: cyclopropane, dimethyl pentane, substituted hexanes, substituted naphthalenes, cyclopentane, 2-heptene, cyclohexane and heptanal.

Air sampling summary

Out of 24 compounds detected in the Florida trunk sample which did not overlap with known or possible gasoline constituents, 16 (67 %) known to be associated with human decomposition events were detected in the odor signature from the Florida trunk carpet sample whose source could not be potentially linked to any of the controls which were analyzed. These included 2-methyl furan, acetic acid methyl ester, butanoic acid methyl ester, carbon disulfide, carbon tetrachloride, chloroethane, chloroform, chloromethane, decanal, dichloroethene, dichloromethane, dimethyl trisulfide, dimethyl disulfide, hexanol, methanethiol and trichloroethene. Of these 16 compounds, seven were significant human decomposition chemicals listed in the database. Only five of these

seven compounds are being used to draw conclusions about the possibility of a decompositional event occurring. Decanal and trichloroethene were dropped from this list because they were only detected in trace amounts. These five compounds are:

Carbon disulfide

appears very early in human decomposition (<100 ADDs^a)
appears in both aerobic and anaerobic decomposition

Carbon tetrachloride

appears very early in human decomposition (<100 ADDs)
appears in both aerobic and anaerobic decomposition
potentially a human specific marker (not seen in select animal remains)

Chloroform

appears very early in human decomposition (<100 ADDs)
primarily detected in deprived oxygen (anaerobic) decompositions

Dimethyl trisulfide

appears very early in human decomposition (<100 ADDs)
appears in both aerobic and anaerobic decomposition

Dimethyl disulfide

appears very early in human decomposition (<100 ADDs)
appears in both aerobic and anaerobic decomposition

^a ADD – accumulated degree day (an accumulation of average daily temperatures))

This assumes that all the control samples contributed equally to the odor signature in the trunk (which is unlikely) and does not take into account that numerous compounds in the controls were detected in trace amounts and that some were potentially highly concentrated by the TST collection procedure. [For example, fluorinated compounds were detected in the Forensics Unit Garage, but were not detected in the Florida vehicle trunk sample potentially indicating very little, if any, contribution of the garage air to the trunk signature].

TSTs collected from the Florida trunk were analyzed even though the trunk liner had been removed and the odor would not have been representative of what was originally present at the time of vehicle discovery. Even with the liner removed, sulfur containing compounds such as carbon disulfide, carbon tetrachloride, chloroform and dimethyl disulfide were still detectable in trace amounts. The trunk was the only location where all these types of compounds were detected.

Common fluorinated compounds usually associated with human decomposition were not detected in the Florida trunk sample. It is possible, although this has not been studied, that a 3 year-old child may not have had sufficient time (many years) to ingest enough fluorinated compounds for them to be incorporated into tissue and then to appear in the decompositional breakdown of soft tissue and bone. Additionally, several of the identified compounds are typically associated with anaerobic decomposition. While the actual significance of this not known, it indicates that any type of decompositional event that might have been associated with the odor in the trunk of the car could have occurred under deprived oxygen conditions.

Laser-Induced Breakdown Spectroscopy (LIBS) for elemental analysis

LIBS analysis was also performed on the both the Florida trunk carpet sample and the control samples. As decomposition progresses, various inorganic elements found in human tissue, such as magnesium (Mg), calcium (Ca), iron (Fe) and sodium (Na) are found in increasing concentrations (over time) in drainage from decompositional events. This technique was utilized to determine if known inorganic components of decompositional events were elevated over the controls and also to determine if the concentration ratios of these elements could be used to determine a rough post-mortem interval (reference 3).

Introduction to LIBS

LIBS provides rapid multielemental microanalysis of bulk samples (solid, liquid, gas, aerosol) in the parts-per-million (ppm) range with little or no sample preparation which has been widely demonstrated. In this technique, a laser vaporizes a small volume of sample material with sufficient energy for optical excitation of the elemental species in the resultant sample plume. The vaporized species then undergo de-excitation and optical emission on a microsecond time scale, and time-dependent ultraviolet-visible spectroscopy fingerprints the elements associated with the spectral peaks. LIBS is typically a surface analytical technique, with each laser pulse vaporizing microgram or submicrogram sample masses. However, the rapidity of sampling (typically 10 Hz laser repetition rate) and the ability to scan a sample surface, provides sufficient statistics for bulk sampling.

The greatest advantage of LIBS is its capability for remote chemical analysis of samples with minimal handling and little or no sample preparation, which minimizes generation of waste to the microgram per pulse of ablated material. The instrumentation and operation of a LIBS system is simpler than some of the more sensitive techniques, and analysis times on the order of minutes, make it more amenable for real-time analysis of chemical processes. Although calibration standards are required for quantitative analysis, the generation of a single calibration curve will suffice for analysis of samples in a similar matrix.

In the analysis of the carpet samples that were obtained, care was taken to scan the sample consistently. A laser beam of 532 nm wavelength was focused onto the surface of the Florida trunk carpet sample and control carpet samples collecting the excited light using collection optics that were delivered to a spectrometer which detected specific band wavelengths. These wavelengths corresponded to between 260 nm to 300 nm for Mg, between 390 to 420 nm for Ca, between 570 to 610 nm for Na, and between 240 to 280 nm for Fe. The data were collected in multiples of five and compared to each other. All spectral information was very consistent within the multiples of spectra that were captured and analyzed. It is interesting to note that every element known to be associated with a decompositional event (that could be detected using this technique) was elevated over control values. [Non metals such as potassium, chloride, etc. have a greater ionization potential than metallic and semi-metallic elements and could not be detected using the current laser system].

The LIBS spectra of Mg, Ca, Na, and Fe for the control carpet and sample carpet are shown in Figures 1-4.

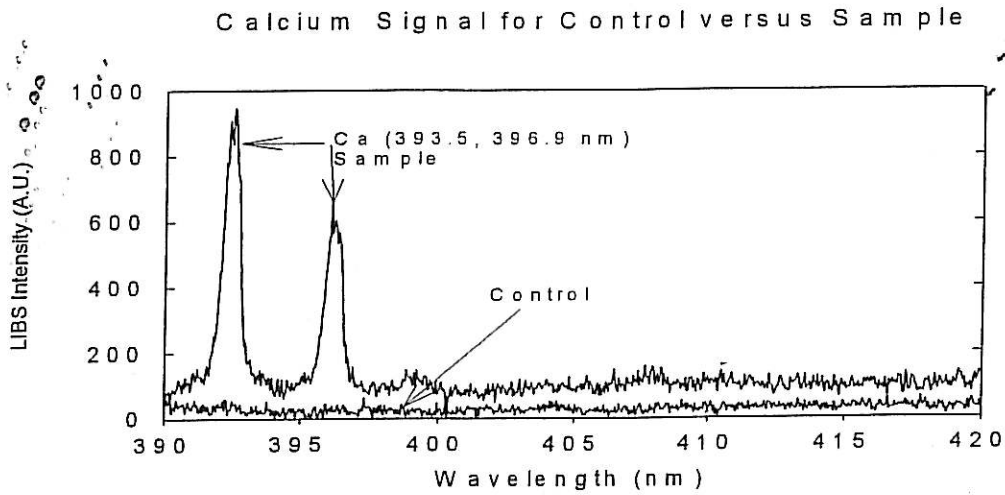


Figure 1. Spectra of control carpet and sample carpet for the presence of Calcium (Ca).

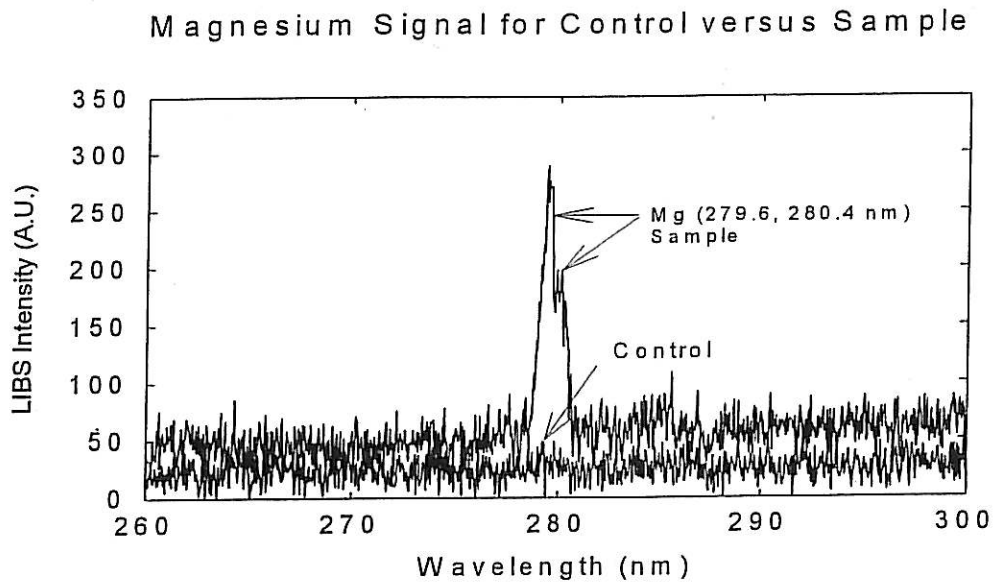


Figure 2. Spectra of control carpet and sample carpet for the presence of Magnesium (Mg).

Sodium Signal for Control versus Sample

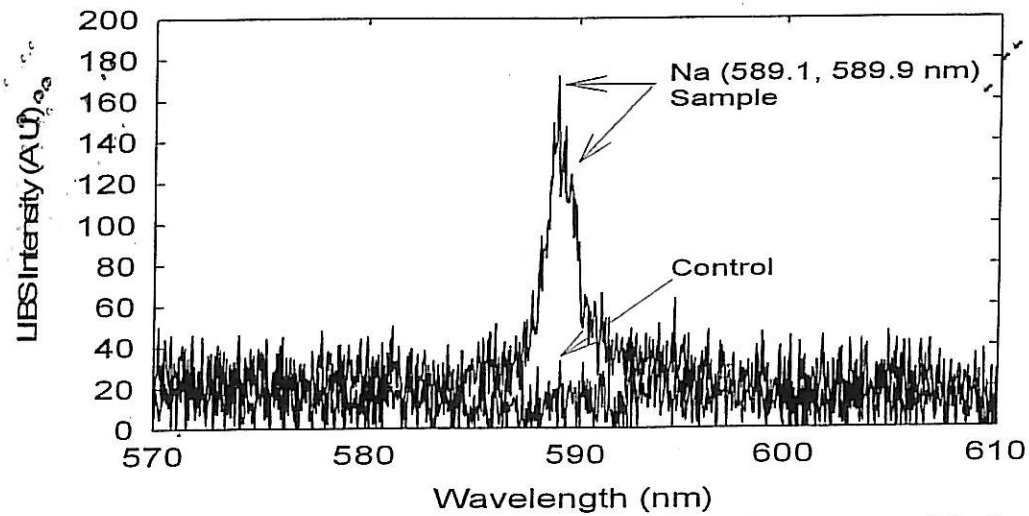


Figure 3. Spectra of control carpet and sample carpet for the presence of Sodium (Na).

Iron Signal for Control versus Sample

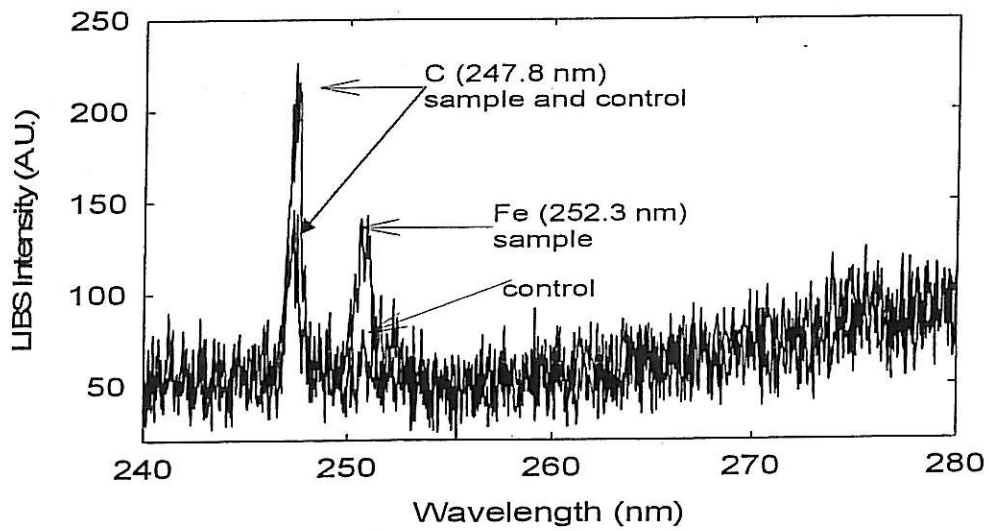


Figure 4. Spectra of control carpet and sample carpet for the presence of Iron (Fe). Carbon - (C).

Post-mortem interval determinations in this instance are best carried out using volatile fatty acids (VFAs), but can be done in a crude fashion using inorganic elements. The 5:1 ratio of calcium:magnesium typically occurs at 90 Accumulated Degree Days (ADDs). An ADD is simply the accumulation of average daily temperatures (in Celsius) over time. The exact temperatures inside the vehicle trunk are not known. If one assumes it would be quite warm – Florida in the summer (~95 degrees F or 35 degrees C), this equates to approximately 2.6 days of decomposition. At 2.6 days, the levels of sodium should be much higher than what was detected using LIBS. This points to a PMI of less than 2.6 days, but the error estimation for sodium is quite high as one approaches the beginning of decomposition. The low concentration of sodium also indicates almost no contribution to the sample from the BlueStar product. Low amounts of carbon (C) also indicate a recent PMI.

While these are still preliminary results (specific retention times must be confirmed with standards, specific compounds should be quantitated and VFA analyses need to be completed), both odor analysis and LIBS results appear to be quite consistent with a decompositional event having occurred in the trunk of the vehicle. Of particular interest is the large concentration of chloroform (not a common ingredient in commercial products) and the presence of sulfur containing compounds in the Florida trunk carpet sample which are particularly characteristic of decompositional events.

Finally, we wish to discuss the possibility that these chemical signatures are of human origin. The decomposition odor products of animal remains (dog, deer and pig - primarily bone) have been studied since these are the most commonly encountered in outdoor environments. These animals can be distinguished from human remains by the percentages of certain classes of chemicals (ketones, amides, aldehydes and alcohols). While the direct correlation of animal bone to early human decomposition may not be exact, the results are interesting and potentially point to a human origin as the source of the scent. Table 2 shows which compounds were detected in the Florida trunk sample and compares them to what is known about animal decomposition.

Table 2

Compound Class	Compound	Detected in FL trunk Tedlar bag sample?	Detected in selected animal remains?	Detected in human remains	Approximate ADD when first detected in human remains
Ketone	2-propanone	yes	Yes (pig only)	yes	230
Ketone	2-decanone	no	yes	yes	1976 (late)
Ketone	2-nonanone	no	yes	yes	4011 (late)
Amide	Acetamide, N,N-dimethyl	no	yes	no	
Aldehyde	hexanal	no	yes	yes	1698 (late and low concentration)
Aldehyde	heptanal	no	yes	yes	1698 (late and low concentration)
Aldehyde	nonanal	no	yes	yes	400 (very low concentration)
Aldehyde	octanal	no	yes	yes	4011 (late)
Aldehyde	pentanal	no	yes	yes	4011 (late)
Aldehyde	decanal	yes	yes	yes	475
Aldehyde	butanal	Yes (trace)	Yes (pig only)	yes	Aerobic decomposition product only
Alcohol	Phenol	no	Yes (dog only)	yes	200 (primarily aerobic decomposition product)
Alcohol	1-pentanol	no	yes	yes	1307
Alcohol	1-heptanol	no	yes	no	
Alcohol	1-hexanol	yes	yes (pig only)	yes	536
Alcohol	ethanol	yes	Yes (pig only)	yes	1307 (gasoline component)

While not conclusive, these data indicate that:

- 1) Nearly all the compounds present in early human decomposition were detected in the trunk samples if their concentrations were high enough to detect. Carbon tetrachloride was also detected and is a human specific marker with these animal sets.
- 2) Compounds that have been detected in these select animal remains and not in humans were not detected in the Florida trunk carpet sample (1-heptanol, Acetamide, N,N-dimethyl). This is also suggestive of a human decompositional event.
- 3) Compounds associated with anaerobic decomposition are seen supporting a possible deprived oxygen type of decompositional event.
- 4) Compounds with a late ADD were not detected supporting an early stage decompositional event.

Conclusions

The correlation between all the techniques, the comparison to what is known about the decomposition of human and animal remains, indications of early decomposition products and the presence of the five key major compounds associated with human decomposition (primarily the sulfur containing compounds) **indicates that a portion of the total odor signature identified in the Florida vehicle trunk is consistent with a decompositional event that could be of human origin.** Additional components that made up a portion of the total odor signature included gasoline constituents and an unusually large concentration of chloroform - far greater than what is typically seen in human decomposition.

These results still do not rule out the remote possibility that an unusual variety of products or materials (not present in the trunk at the time of vehicle discovery) may have had some contribution to the overall chemical signature.

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Tables listing the constituents of gasoline

Table 1 Hydrocarbon Constituents of Typical Gasoline	
Straight Chain Alkanes	
propane	
n-hexane	
n-dodecane	
Branched Alkanes	
isobutane	
2,2-dimethylbutane	
neopentane	
3-ethylhexane	
Cycloalkanes	
cyclohexane	
n-propylcyclopentane	
ethylcyclohexane	
Straight Chain Alkenes	
cis-2-butene	
1-pentene	
trans-2-heptene	
Branched Alkenes	
2-methyl-1-butene	
4,4-dimethyl-1-cis-2-pentene	
Cycloalkenes	
cyclopentene	
3-methylcyclopentene	
Alkyl Benzenes	
benzene	
toluene	
ethylbenzene	
o-xylene	
m-xylene	
p-xylene	
1,2-dimethyl-3-ethylbenzene	
1,2,3-trimethylbenzene	
1,2,4,5-tetramethylbenzene	
n-propylbenzene	
Other Aromatics	
indan	
1-methylindan	
phenol	
Polycyclic Aromatic Hydrocarbons (PAHs)	
naphthalene	

Source: Adapted from Cole (1984)

Table 1. Flame-retardant chemical components used in the synthesis of polyimides

<p>Oxygenates</p> <ul style="list-style-type: none"> methyl tertiary-butyl ether (MTBE) ethanol ethyl tertiary-butyl ether (ETBE) tertiary-butyl alcohol (TBA) tertiary-amyl ethyl ether (TAE) diisopropyl ether (DIPE) tertiary-amyl methyl ether (TAME) tertiary-amyl alcohol (TAA) methanol 	<p>Corrosion inhibitors</p> <ul style="list-style-type: none"> carboxylic acids sulfonates amine/alkyl phosphates
<p>Anti-knock compounds</p> <ul style="list-style-type: none"> tetra-ethyl lead (TEL) tetra-methyl lead (TML) methylcyclopentadienyl manganese tricarbonyl (MMT) 	<p>Metal deactivators</p> <ul style="list-style-type: none"> diacylhydrazine amines phenolic amines thioarea
<p>Anti-oxidant compounds</p> <ul style="list-style-type: none"> hindered phenols phenyl tene diamines aminophenols 	<p>Ignition controller additives</p> <ul style="list-style-type: none"> tri-<i>c</i>-cresol phosphates
<p>Anti-icing compounds</p> <ul style="list-style-type: none"> isopropyl alcohol amides/amines glycols organophosphate ammonium salts 	<p>Detergents</p> <ul style="list-style-type: none"> aminohydroxamide alkylphenols imidazolines
	<p>Lead scavengers</p> <ul style="list-style-type: none"> 1,2-dichloroethane (EDC) 1,2-dibromoethane (EDB)
	<p>Dyes</p> <ul style="list-style-type: none"> azobenzene-4-azo-2-naphthol benzene-azo-2-naphthol para-diethyl aminobenzene 1,4-disopropylaminoanthraquinone

Source: adapted from Cummings (1977) and Kury, et al. (1997).

Table 1

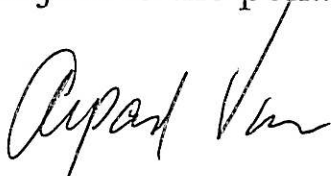
Compounds identified in odor from Florida trunk carpet sample (Tedlar bag)	Is compound listed in Decompositional Odor Database?	Compounds identified in control carpet samples from Knoxville, Junkyard?	TST -Compounds identified in trash bag contents from Florida trunk?	TST - Compounds identified in Florida vehicle interior	Compounds detected in ORNL Laboratory air	Compounds detected in decomposing pizza	Is compound found in gasoline vapors?	TST - Compounds detected in FL garage air	TST - Compounds detected in trip blank	Comments
1-methyl-ethyl benzene	Yes	no	no	no	no	no	Yes	no	no	
1,2-Pentadiene	Yes	no	no	no	no	no	maybe	no	no	
1H-Indene dihydro	no	no	no	no	no	no	no	no	no	
2-butanone	Yes	no	no	no	no	Yes ¹	no	no	no	
2-chloropropane	no	no	no	no	no	no	no	no	no	
2-methyl furan	Yes	no	no	no	no	no	no	no	no	
2-methyl hexane	Yes	no	Yes	no	no	no	Yes	no	no	
2-methyl propanenitrile	no	no	no	no	no	no	no	no	no	
2,3-butadiene	no	no	no	no	no	no	no	no	no	
2-methyl butanal	no	no	no	no	no	Yes ¹	no	no	no	
3-methyl butanol	no	no	no	no	no	Yes ¹	no	no	Yes	
3-methyl hexane	Yes	no	Yes	no	no	Yes ¹	maybe	no	no	
3-methyl pentane	Yes	no	Yes	no	no	no	maybe	Yes	no	
3-methyl butanal	Yes	Yes ¹	no	Yes	no	no	Yes	Yes	no	
4-methyl-2-pentanone	no	no	no	no	no	Yes ¹	no	no	no	
Acetaldehyde	Yes	Yes ¹	no	no	no	no	no	no	no	
Acetic acid, methyl ester	Yes	no	no	no	no	Yes	Yes	no	no	
Acetone (2-propanone)	Yes	Yes ¹	no	no	no	no	no	no	no	
Benzene	Yes	no	Yes	Yes	no	Yes	Yes	Yes	no	One of top chemicals in database
Butanal	Yes	Yes ¹	no	no	no	no	no	no	Yes	
Butanoic acid, methyl ester	Yes	no	no	no	no	no	no	no	Yes	
Carbon disulfide	Yes	trace*	no	no	no	no	no	no	no	
Carbon tetrachloride	Yes	no	trace*	no	no	no	no	no	no	One of top chemicals in database
Chloroethane	Yes	no	no	no	no	no	no	no	no	One of top chemicals in database
Chloroform	Yes	Yes ¹ (trace amounts)	no	no	no	no	no	no	no	Unusually high amount detected; One of top chemicals in database (anaerobic formation)
Chloromethane	Yes	no	no	no	no	no	no	no	no	
Decanal	Yes (trace)	no	no	no	no	no	no	no	no	
Dichloroethene	Yes	no	no	no	no	no	no	no	no	One of top chemicals in database
Dichloromethane	Yes	no	no	no	no	no	no	no	no	
Dimethyl trisulfide	Yes	no	no	no	no	no	no	no	no	
Dimethyl undecane	no	no	no	no	no	no	no	no	no	
Dimethyldisulfide	Yes	no	no	no	no	no	no	no	no	One of top chemicals in database
Ethanol	Yes	Yes ¹	no	no	no	trace ¹	no	no	no	One of top chemicals in database
Etheneamine	no	no	no	no	no	Yes (large amount)	no	no	no	
Ethyl benzene	Yes	no	no	no	no	Yes	Yes	no	no	
Hexane	Yes (trace)	Yes	no	no	no	no	Yes	no	no	One of top chemicals in database
Hexanol	Yes	no	no	no	no	Yes ¹	Yes	no	no	One of top chemicals in database
Isobutanol	Yes	no	no	no	no	no	no	no	no	
Isocitane	Yes	no	no	no	no	Yes ¹	no	no	no	
Limonene/Pinene	Yes	no	Yes (limonene)	no	no	no	Yes	no	no	Terpene (one source is from vegetation)
Methmethiol	Yes	no	no	no	no	no	no	no	no	
Methanol	Yes - see comment	Yes ¹	no	no	no	no	no	no	no	Methanol identified subsequent to database development
Naphthalene	Yes	no	Yes	no	no	Yes	Yes	no	no	One of top chemicals in database (anaerobic formation)
Octane	Yes	no	no	Yes	no	no	Yes	no	no	
Pentane	Yes	no	no	Yes	no	Yes ¹	no	Yes	Yes	
Tetrachloroethene	Yes	no	Yes	no	no	no	no	Yes	no	One of top chemicals in database (anaerobic formation)

Compounds identified in odor from Florida trunk carpet sample (Tedlar bag)	Is compound listed in Decompositional Odor Database?	Compounds identified in control carpet samples from Knoxville Junkyard?	TST - Compounds identified in trash bag contents from Florida trunk?	TST - Compounds identified in Florida vehicle interior	Compounds detected in ORNL laboratory air	Compounds detected in decomposing pizza	Is compound found in gasoline vapors?	TST - Compounds detected in FL garage air	TST - Compounds detected in trip blank	Comments
Tetrahydrofuran	no	no	no	no	no	no	no	no	no	
Toluene	Yes	Yes ¹	Yes	Yes	no	Yes	Yes	no	no	One of top chemicals in database
Trichloroethene	Yes (trace)	no	no	no	no	no	no	Yes (less than in FL carpet sample)	no	One of top chemicals in database
Trimethyl pentene	Yes	no	no	no	no	no	maybe	no	no	
Xylene(s)	Yes	no	Yes	Yes	no	Yes ¹	Yes	no	no	
	yes	no	Yes	no	1,3 butadiene, 2-methyl ¹	no	no	Yes	no	
	no	no	no	Yes	1,3 Pentadiene ¹	no	maybe	Yes	no	Not detected in Florida trunk sample
	no	1-butanol	no	no	no	no	no	no	no	Not detected in Florida trunk sample
	no	2-methyl propanol	no	no	no	2-methyl propanol	no	no	no	Not detected in Florida trunk sample
	yes	2-methyl-1-propene	no	no	no	no	no	no	no	Not detected in Florida trunk sample
	yes	2-propanol	no	no	no	no	no	no	no	Not detected in Florida trunk sample
	yes	no	no	no	no	Hexanal	no	no	Yes	Not detected in Florida trunk sample

¹Significantly less detected than in 1998 Pontiac Sunbird in Florida; trace* - tentative identification, unable to confirm identification due to very low concentration and overlap with higher abundance constituents

Affidavit of Arpad Vass

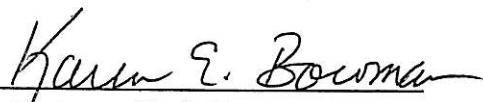
I hereby swear that the document entitled Forensic Report Orange County, Orlando, Florida, Preliminary Report #2 is a true and correct report of my preliminary findings and opinions subject to the additional analyses suggested therein. (The only known error in the report is that only two Pontiac Sunfire vehicles, not three, were sampled to collect control carpet material). I hereby swear that the above is true and correct subject to the penalties of perjury.



Arpad A. Vass, Ph.D.
Oak Ridge National Laboratory
Oak Ridge, Tennessee

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2008 OCT 10 PM 1:43
STATE ATTORNEY
NINTH JUDICIAL CIRCUIT

Sworn and subscribed before me this 8th day of October 2008.


Notary Public



My Commission Expires June 5, 2010