

## **Forensic Anthropology Case Report**

*(Reflecting work performed from November 9, 2005 through July 4, 2006)*

*Calumet County Sheriff's Office Case # 05-0157-955*

*Wisconsin Department of Justice Division of Criminal Investigation (DCI) Case # 05-1776*

*Wisconsin State Crime Laboratory Case # M05-2467*

*Dane County Coroner's Office Case # 05-1681*

*University of Wisconsin Medical School Autopsy # W05-570-F*

*FBI Case # 62D-MW-44363/Title: Steven Avery; Teresa Halbach-Victim (Deceased)*

*Calumet County District Attorney Case # 2005CA000607*

*Court Case # 05-CF-381*

**Forensic Anthropological Profile:** *Adult female of undetermined ancestry and stature. Age, less than 30-35 years. Deliberate attempt made to obscure cause and manner of death through burning. Victim of homicidal violence.*

### **Background**

*While returning from Denver to Madison on Wednesday evening November 9, 2005, I learned that I had received a telephone message from Special Agent Dorinda Freymiller of the Wisconsin Department of Justice's Division of Criminal Investigation. The message was logged in at 1739 and detailed the transfer of a white corrugated box of burned fragmentary bones from S/A Freymiller to me. The sealed box was left for me on November 9, 2005 at my place of work (816 [REDACTED], Madison, Wisconsin) and was received and signed for by Ms. Debra Cravens, a co-worker. Because I was not due back in Madison until later that evening and would not be at work until the following morning, Dr. Kenneth Bennett, a local forensic anthropologist, was asked to determine if the bone was of human origin and to provide any other information that might be useful in identification. Results of his brief examination are detailed in his two-page summary report dated November 10, 2005 where he identifies the bone as coming from an adult human female, probably between the ages of 20 and 50 years. Dr. Bennett's report was provided to me by S/A Fassbender on February 25, 2006.*

*S/A Freymiller's hand-written note that accompanied the corrugated box described a missing woman named Theresa Halbach who had not been seen since October 31, 2005, and the possibility that the burned remains may be related to her disappearance. I learned that a field response team from the Wisconsin State Crime Laboratory (Madison) responded to the scene in Calumet County and had recovered the burned bone initially presented for analysis. In that note, I was given the name and cell phone number for S/A Tom Fassbender, 920.427-[REDACTED], from the DCI Appleton office, who is in charge of the investigation. I was also given the name and cell phone number for S/A Tom Sturtevant (Appleton) who was the individual who first found the burn pile at the scene.*



The same evening at 1751 I contacted S/A Rodney Pevytoe (608.225-██████), an arson investigator for the Division of Criminal Investigation who was on scene. He indicated that personnel from the Crime Laboratory had screened material from a 'burn pile' and that he was in the process of re-examining material from the pile that remained after they departed. Following that call, I called S/A Fassbender and spoke for with him. I then called Dr. Bennett at 1805 who informed me that he was able to briefly examine some of the burned bone transported to him by S/A Freymiller and that he believed the bone to be that of an adult female.

When I arrived at my office on Thursday, November 10, 2005 at 0950, I took custody of the white corrugated box (that was inside of a brown unlabeled grocery bag on top of my desk) and locked it in a file cabinet to which I had the only key. The box was sealed on three of four sides with evidence tape and that tape was intact when I received and examined the box. With the box was a hand-written note on two sides of an 8.5 x 11-inch yellow lined sheet from S/A Freymiller with background on the November 8, 2005 discovery and contact telephone numbers for her (cell-225-██████, office-264.6-██████) if I had any questions. The box was labeled as "Contents Sifted from Burn Pit near Steve's Residence/Garage, 11-8-05, JRE" and is referenced on Wisconsin Department of Justice Property Receipt C 10987 dated November 9, 2005 that accompanied the box. The box was also labeled with the Calumet County Sheriff's Office red label # 8318 and the yellow Wisconsin State Crime Laboratory (Madison) label identifier # M05-2467 A1. The outside of the white box retained black smudges.

### **Examination and Analysis**

Because of the extreme level of detail involved in the forensic anthropological examination and the documentation of the analysis of these fragmentary and burned human remains, I refer those who may be interested in detailed bone inventories, the opening and closing times of evidence tape and containers and other such information to case notes that are on file with the undersigned. Photography was performed on November 10, 12, 13, 15, 16, and 17, 2005 and January 17, 26, 28 and February 19, 2006. All digital photographs taken to date are on file with the undersigned and the Calumet County District Attorney. None of those original photographs have been altered; each represents a true and accurate likeness of the image depicted.

On November 10, 2005 I personally transported the unopened sealed box of bone to the Dane County Coroner's Office and it was logged in at 1630 by the Duty Coroner as Dane County Coroner's Case #05-1681; a label was affixed to the top of the box by the undersigned with that case number. I took sixteen color digital photographs of the box on the same afternoon before opening it and subsequent to my initial examination. I sorted the burned human bone (by element) and segregated other non-bone items and re-sealed the box. The box then only contained two chux with loose dirt and very tiny non-diagnostic items that could not be identified because of their small size; no identifiable human bone remained in the box. The human bone, separated by skeletal

area/element, was individually bagged in separate Ziploc bags. In total, 12 different bags were created:

1. Cranial/face/dental.
2. Scapula/clavicle.
3. Upper arm bones.
4. Ribs.
5. Metacarpals/metatarsals.
6. Spine and sacrum.
7. Pelvis.
8. Lower leg bones.
9. Metal.
10. Fabric and plant material.
11. Miscellaneous bone to identify.
12. Non-metal, non-biological.

Each of those individually labeled Ziploc bags was placed inside of the original brown grocery bag that was then labeled by me as "Package #2 Anthropology" and sealed with evidence tape.

On November 11, 2005 a brown corrugated box (unsealed) was delivered to the Dane County Coroner's Office by S/A James Holmes who received the articles from Deputy Rick Riemer of the Calumet County Sheriff's Office. The box, used only for transport, contained five (5) lidded plastic shoebox-sized containers, each sealed with evidence tape and was received by Deputy Coroner Colleen Little at 1350 hours. Each container was identified with the Calumet County Sheriff's case number, an evidence tag number (7924, 7942, 7943, 7944, 7936), and the names of those who collected the material in each container as well as the provenience of the material. The Dane County Coroner's label with case number was affixed to the top of each container and the corrugated box with the five containers was placed in the morgue cooler for my later examination. Accompanying the delivery was a Division of Criminal Investigation property receipt, number D 6264, dated November 10, 2005, detailing all the associated information.

On November 12, 2005 I examined the contents of four of the five shoebox-sized sealed and lidded containers identified as Items #1 through 4 (Tags 7924, 7942, 7943, and 7944, respectively). The contents of each were sorted and different types of material within each box were bagged separately in Ziploc bags. Once the sorting was completed, I resealed each lidded container with evidence tape. They were identified as:

1. Item #1 (Tag 7924, collected November 10, 2005), "Unidentified material suspected to be bone, multiple pieces." Items were sorted into the following categories and bagged by type: cranial/dental, vertebral/sacrum/manubrium, hand and wrist, rib(s), long bone, human bone to ID, non-diagnostic human bone,

non-biological, and fabric. All nine bags were placed back in to the original plastic lidded container.

2. Item #2 (Tag 7942), collected November 10, 2005, "Bone fragments found north end of burn pile, south end of garage." The majority of the contents represented burned insulating material (wire?). No bone was identified in this box. Items were sorted into the following categories and placed within separate labeled vials by type: burned wire(?) insulation, metal, fiber and hair (possible animal hair mixed in). All vials were placed back into the original plastic lidded container.
3. Item #3 (Tag 7943), collected November 10, 2005, "Bone fragments found East Side of dug out hole, south of garage." Items identified included 11 fragments of human bone (no cranial) and non-biological.
4. Item #4 (Tag 7944), collected November 10, 2005, "Bone fragments found West side of dug out hole." Items separated into four Ziploc bags: human bone (no cranial), fiber, metal and plant material, and non-biological.

On November 13, 2005 I examined the contents of Item #5 (Tag 7936) collected November 10, 2005 and identified as "Unknown material suspected to be burned bone, south of red house trailer." I sorted the contents, bagging bone fragments and other unidentified non-bone items separately. The box was resealed with evidence tape and placed back in the cooler with Items #1-4 examined the previous day.

On the same day, I personally transferred dental structures (from Item #1, Tag 7924) to Dr. Donald O. Simley II, DDS, at the Dane County Coroner's Office, for his forensic odontological analysis.

From 2000 to 2130 hours on November 14, 2005 I met with Special Agents Rodney Pevytoe, Elizabeth Feagles and Michael Rindt at the Dane County Coroner's morgue facility to review with them the sorting of the bone fragments initially recovered by the Wisconsin Crime Laboratory. I weighed the contents of each Ziploc bag containing sorted human bone recovered up until that point with the following results:

Cranial/face (dental removed the previous day)	.20 kg.
Miscellaneous bone to identify	.08 kg.
Lower leg bone	.15 kg.
Pelvis	.04 kg.
Spine	.04 kg.
Upper arm bones	.18 kg.
Ribs	.05 kg.
Scapula/clavicle	.03 kg.
Metacarpals/metatarsals	.02 kg.
<b>TOTAL</b>	<b>.79 kg.</b>



Converted from kilograms to pounds/ounces, the human bone fragments recovered by the Crime Lab weighed a total of 1.74 pounds.

I received a call from S/A Fassbender at 1545 on November 14, 2005 informing me that in speaking to Ms. Halbach's parents, they indicated that Theresa was double-jointed. He did not know if they would be important to me as I proceeded to examine the remains, but wanted to pass on the information.

At 1030 on 15 November 2005 I called S/A Fassbender to inform him that I noted and documented the presence of internal beveling immediately adjacent to an incomplete semi-circular defect of a burned cranial bone (left parietal) fragment; because of that finding, I recommended taking X-rays of all of the cranial bone fragments. He indicated that he would contact Michael Stier, M.D. or Robert Huntington M.D. at the UW-Medical School to see about using the Veteran's Hospital imaging facility to take radiographs. I spoke to Dr. Stier (pager 608-██████████ x 2306) later in the day and we made arrangements to meet at the V.A. Hospital morgue at 1600 on Thursday, November 17, 2005 to X-ray all cranial fragments recovered and identified to date. I arranged to meet S/A Holmes at the Dane County Coroner's Office at 1530 on the 17<sup>th</sup> and together we would meet with Dr. Stier at 1600.

At 1635 on November 15, 2005, S/A Holmes transferred the three items detailed on the Division of Criminal Investigation's Property Receipt D 6258 to me at the Dane County Coroner's Morgue facility. I photographed each package (10 images in total) and placed the unopened items in the morgue cooler along with the rest of the case items received to date. Mrs. Fran Lutz transferred these items from the Wisconsin Crime Laboratory in Madison to S/A Holmes on the same day in a brown paper bag with the Crime lab case number (M05-2467) label affixed to it. Each of the three items in the bag also had the same label affixed to it. Those three items include:

1. Tag 7925, "Pillbox containing U/I charred material." Contents include 10 small pieces of wood, one small, triangular, piece of bone, three dental structures. All items were placed back in small box for examination by Donald O. Simley II, DDS. I called Dr. Simley on his cell phone to let him know that additional teeth were found and returned the box to the morgue cooler for later pick-up by Dr. Simley.
2. Tag 7926, "Paper bag unidentified charred material." Contents included desiccated muscle tissue and five bone fragments.
3. Tag 7928, "Pillbox U/I charred material," collected November 10, 2005, "Unidentified material charred." This box was empty upon receipt and was transferred to S/A Holmes on November 18, 2005.

I prepared the contents of Tag 7926 for transfer to Laura Gioeni at the FBI's Mitochondrial DNA Laboratory in Quantico, Virginia. Present were five bone fragments and muscle tissue. The largest of the bone fragments appears to have come from a human ulna (or fibula?) shaft and measures approximately 59.2 mm in length. The

remaining four splintered fragments ranged in size from 12.5 mm to 11 mm in length. The largest piece of muscle tissue measures approximately 61.3 mm by 30.0 mm. There are two other pieces of tissue that measure approximately 45.1 mm x 10.5 mm and 36.6 mm x 13.0 mm at their thickest dimensions. Other smaller and thinner muscle tissue strands are also present.

In preparation, I purchased bleach and two Rubbermaid-brand lidded containers. To avoid contamination I wore a gown, mask and hair net and made multiple glove changes during the collection and packaging process. Prior to using my sliding calipers they were also thoroughly cleaned with bleach. The container and its lid were thoroughly cleaned with Clorox-brand bleach and dried prior to placing the small paper bag (with bone and muscle) sealed with evidence tape inside. The plastic lidded container was sealed with evidence tape on all four sides and photographs were taken. The Wisconsin Department of Justice, the Wisconsin Crime Laboratory and Calumet County Sheriff's Office case numbers were written in indelible black Sharpie ink on the lid and the container was placed back in the morgue cooler. The attached copy of my Evidence Transmittal document details the November 18, 2005 transfer at 0930 hours to S/A Frederick C. Pflueger of the FBI's Madison, Wisconsin office. The transfer was made by the undersigned at the Dane County Coroner's morgue facility in the presence of S/A James Holmes.

On November 16, 2005, in preparation for X-rays to be taken the following day at the V.A. Hospital in Madison, I segregated individual bags of identified cranial fragments logged in on DCI Property Receipt C 10987 and from Evidence Tags 7924, 7943, 7944 and 7936 and assembled them in one large Ziploc bag identified as "Cranial Bone to X-Ray." They remained in the Dane County Coroner's morgue cooler, sealed with evidence tape, until I met with DCI Special Agents James Holmes and Lisa Wilson who met me at the morgue the following afternoon at 1530 hours. We departed together (in two cars) for the V.A. Hospital morgue, arriving there together at approximately 1550 hours; we met Dr. Stier at 1600 hours. Present for the X-ray of cranial fragments were:

- Leslie E. Eisenberg, Ph.D., Forensic Anthropologist
- James C. Holmes, Special Agent, DCI
- Lisa A. Wilson, Special Agent, DCI
- Nicole A. Nielsen, UWHC Radiology Student
- Kristen Gumbinger, UWHC Radiology Student
- Lois Marchant, UWHC Radiology Student
- Lisa Bennett Ostrem, RTR
- Margaret Kessenich, RTR
- Michael Stier, M.D., Forensic Pathologist

RTR Kessenich began taking radiographs of the cranial fragments laid out by the undersigned at 1610. Sixteen digital photographs of each grouping of (or individual) bone to be X-rayed were taken by the undersigned. Any bone fragments showing

*radiopaque areas in X-ray were wrapped separately, put back into their original sort bag, and then placed back within the large "Cranial bone to X-ray bag." In total, seven cranial fragments showed radiopaque signatures signifying the presence of a material denser than the surrounding bone that was embedded in the bone and not visible to the naked eye. Special Agents Holmes and Wilson and I departed the radiology suite at 1740 hours with ten radiographs identified sequentially as "MK/#1 – MK #10." Note that MK #8 was taken of an item known not to be bone for comparative purposes. I arrived back at the Dane County Coroner's morgue facility at 1758 hours and all of the cranial fragments were returned to the morgue cooler at 1815 hours. The 10 X-ray films are on file with the undersigned and are stored in the anthropology section of the morgue under the following case numbers:*

- 1. V.A. Hospital/UW Morgue 05-570F*
- 2. DCI 05-1776*
- 3. DCCO 05-1681*

*On November 24 and December 2, 2005, I began the process of refitting burned cranial fragments identified as human through the forensic anthropological analysis. Because human bone fragments had been recovered on multiple occasions, and from different locations on the Avery property, it was important to be able to distinguish the origin of each fragment that might refit with another fragment from a different location. Fragments were color-coded with a small dot of nail polish identifiable (by color) as to location. Every attempt was made to place the dot so as not to obscure any anatomical landmark, diagnostic feature or defect to the bone. The color-coded legend is on file with the undersigned. On December 10, 2005 I continued to refit human bone fragments and was able to join two left clavicle fragments (shaft and lateral end) and two ulna shaft fragments (side unknown). These two postcranial refits were made from the fragmentary bone initially recovered by the Wisconsin Crime Lab from the burn pit. In addition, other bone fragments from the radius and femur were identified and their articular dimensions were measured; the measurements obtained allow the undersigned to determine that the remains presented for analysis are those of an adult female (see Sex Determination section below).*

*Boxes with the following tag numbers were transferred to the Calumet County Sheriff's Office on December 19, 2005:*

- 1. Tag 7936 (empty, not opened).*
- 2. Tag 7942 (1 bag non-biological, 1 capped vial of hair, 1 capped vial of fiber, and 1 capped vial of metal objects).*
- 3. Tag 7943 (retained 1 bag of human bone; returned 1 bag of non-biological).*
- 4. Tag 7944 (retained 1 bag of human bone and 1 package of loose dirt and tiny pieces of bone; returned 1 bag of non-biological, 1 bag of metal and plant material and 1 bag of fiber).*
- 5. Tag 7924 (retained 6 bags of human bone; returned 1 bag of fabric fragments and 1 bag of non-biological).*

6. From DCI Property Receipt C 10987 (retained all human bone; returned 1 bag of fabric and plant material, 1 bag of non-metal, non-biological material, and 1 bag of metal objects). The empty white corrugated box was also returned to the Calumet County Sheriff's Office at 2023 hours on December 19, 2005.

At the request of the Calumet County Sheriff's Office and the Division of Criminal Investigation, on December 19, 2005, I assisted in the re-screening of soil taken from the Avery property at the Wisconsin State Crime Laboratory in Madison. Prior to arriving at the State Crime Laboratory that morning, I removed all case material from the Dane County Coroner's morgue facility (with the exception of the X-rays) to bring to the crime lab for reference purposes, if necessary. At the end of the day, all non-biological material sorted and identified by me was transferred to Deputy Rick Riemer, Evidence Technician with the Calumet County Sheriff's Office. I departed the State Crime Laboratory at 2050 hours and arrived at the Dane County Coroner's morgue facility at 2103 hours; all human case material taken that morning was returned to the morgue cooler. I departed at 2105. None of the case material had been opened prior to its return to the Coroner's morgue facility.

On December 20, 2005 at 1710 hours I met Deputy Riemer on Frances Street (just south of Johnson) in Madison who transferred the following sealed items to me:

1. Tag #6200, small box of teeth, dated 12-19-05.
2. Tag #8150, small box of teeth, dated 12-20-05.
3. Tag #6197, small box of suspected bone fragments, dated 12-19-05 (from Item #7923).
4. Tag #8118, lidded plastic container of suspected bone fragments, dated 12-19-05 (from Item #7923).
5. Tag #8140, lidded plastic container of bone fragments from #7299, dated 12-20-05.
6. Tag #8148, lidded plastic container of bone fragments, dated 12-20-05.

I arrived at the Dane County Coroner's morgue facility at 1724 hours and placed these newly collected items in the cooler. I called Dr. Donald Simley at 1740 to advise him that there were two new boxes of teeth for him to examine. I awaited his arrival at 1804 and I transferred Tag #s 6200 and 8150 to him. He opened the evidence tape in my presence to have a brief look at the items recovered; we both departed the morgue facility at 1835 hours.

On the afternoon of January 12, 2006 I met at the Dane County Coroner's morgue facility with Investigator Wiegert of the Calumet County Sheriff's Office and S/A Thomas Fassbender of the Division of Criminal Investigation to review my progress to date. The review focused specifically on the cranial bone recovered, the re-fits I had been able to complete and the cranial and postcranial traits I observed that would help in assessing age and sex of the remains. We also viewed the X-rays and I pointed out the specific



areas in the skull fragments that showed radiopaque density. I also presented for their examination, the cranial fragment that shows evidence of internal beveling.

On the same day, I received from Investigator Wiegert, a small lidded sealed container with Tag #7955, bone fragments recovered November 11, 2005 from "dirt mound south of red garage." I examined the contents and retained a few items in a Ziploc bag that was placed inside of "Package #2 Anthropology that was sealed at 1420 hours. The lidded container was returned to Investigator Wiegert the same day.

On January 15, 2006 I received a telephone call from Investigator Wiegert indicating that more bones were found in the Calumet County Sheriff's Office evidence room that he wanted me to examine. That material was received on January 17, 2006 at 1140 at the Dane County Coroner's morgue facility and consisted of the following Tag #s: 7964 (possible human bone fragment with multiple cuts, pupal casings and other material; items smelled of fuel), 7960 (non-human), 8675, 8701 (non-human). Tag # 8675 contained many elements of unburned non-human bone and other items as well as 10 fragments of bone with suspected cut marks. Eight of the 10 fragments (one definite non-human) were burned/calcined. The contents of these tag numbers were examined on January 17 and January 26, 2006.

On January 26, 2006 I received a sealed volatile can identified on DCI Property Receipt D 6266 from S/A James Holmes identified as, "Dog Stool (Item #8) with Calumet County Sheriff's Office Tag # 7937. The biohazard bag inside of the can was not opened since the two X-ray images brought by S/A Holmes showed only showed the presence of a spoon inside of the feces that were collected from the Avery property. The contents were not screened and the can was resealed at 1546.

On the same day I examined the contents of Tag # 8148 (non-human material, non-diagnostic human bone fragments, fabric/paper fragments) and 8140 (burned and unburned non-human bone, non-diagnostic calcined and burned bone fragments (some may be human) and a light greenish-blue wire. Each of those Tags was collected on December 20, 2005 as the result of the screening activities at the Crime Laboratory in Madison.

On January 28, 2006 I examined the contents of Tag # 8118 (from Item #7293) that yielded bone, a human tooth root and another small possible enamel fragment (identified later by Dr. Simley as plastic once it had been cleaned). The dental remains were transferred to Dr. Simley on the same day at 1830. The non-human bone was separated from the suspected human bone that included two distal phalanx fragments, cranial bone, rib, vertebral facets and a partial anterior body fragment of the first cervical vertebra. On the same day I examined the contents of Tag # 6197 (from Item #7923) that yielded non-human bone and other material as well as a complete human distal phalanx.

Each of these Tags was collected on December 19, 2005 as the result of the screening activities at the Crime Laboratory in Madison.

In the morning of February 15, 2006 I transferred two separate bags sealed with evidence tape to S/A Holmes:

- One bag, identified as "Cranial/face/dental," containing a very small area of partially reconstructed skull along with the parietal fragment exhibiting the semi-circular, internally-beveled defect.
- A second bag identified as, "Cranial refits."

S/A Holmes departed the Dane County Coroner's morgue facility at 0840 for the Wisconsin Crime Laboratory in Madison where he would transfer these items to Mr. Ken Olson for analysis. These two bags were identified on DCI Property Receipt D 6276 as items 2 and 1, respectively.

On February 19, 2006 I re-examined the contents of Tag # 8675 and photographed the cut bones (possibly human) associated with Tags # 7964 and 8140. I rinsed items in Tag # 6197 and inventoried the diagnostic human bone. Present are: one human (toe) phalanx, one ulna head fragment (side undetermined), one outer cortex fragment of the mandible (lower jaw), eight vertebral fragments, three cranial fragments (one definite parietal), and two other human bone fragments (one of which may have a cut mark). The bone, even after rinsing, remained black in color.

On April 10, 2006, at the request of Investigator Wiegert, I participated in the screening of soil taken from the gravel pit area of the Avery property. This work was performed at the Calumet County Sheriff's Office and was undertaken in an effort to locate any additional human bone. That activity continued on the 11<sup>th</sup> of April (without me). All items recovered during that two-day period were sent to the Dane County Coroner's Office and received by Deputy Coroner Thorpe on April 25, 2006. I was notified by Thorpe at 1329 that the package had arrived and I requested that he place it in the morgue cooler with other items from this case. I have not yet had an opportunity to examine that material.

**Number of Individuals Present:**

The human bone identified to date is burned, calcined and extremely fragmented. Some suspected human bone fragments show evidence of possible cuts. Because only a fraction of an entire human skeleton is present it is impossible to say with certainty that only one individual is represented. However, of the recognizable human bone, virtually every area of the skeleton is present (by at least one fragment), there is no obvious duplication of elements and, the age and sex determined from the fragments are all consistent with an adult female. Two left clavicle fragments (shaft and lateral end) and two ulna shaft fragments have been refitted. Additionally, a small area of the skull has been reconstructed. Given the degree of burning, it is not unexpected to find that the weight of the skeletal remains represents a fraction of the weight of a living individual.

Studies of commercial cremations find that "Cremains weight represented approximately 3.5% of total body weight in adults" and that the mean cremains weight for the females in the study was 1840 grams (Warren and Maples 1997). It is important to note that these figures do vary by age, sex and region (Bass and Jantz 2004) and that there is overlap between some cremation weights of males and females. To extrapolate, then, in a general way, if the recorded weight for Ms. Halbach at 135 pounds was accurate at the time of her death, the weight of her recovered remains therefore should probably not exceed 4.7 pounds. The total weight of the human remains excavated initially by the Wisconsin Crime Laboratory was 1.74 pounds. Since that initial recovery additional human bone has been identified but the total weight of that bone has not yet been quantified. Further work to assess the total weight of human bone recovered in this case will be completed and detailed in a future report once the material screened and collected in early April has been carefully examined and the two bags of bone transferred to the Crime Lab on February 15, 2006 have been returned. I will also obtain the weight of all dental structures recovered from Donald O. Simley II, DDS in order to develop a composite total.

**Conservation/Preservation:**

Badly burned (charred and calcined) and highly fragmented human bone and many other items of non-biological origin were presented for forensic anthropological examination and analysis. Where necessary, bone was rinsed with warm water to facilitate examination and cranial bone fragments were reapproximated with glue. Details are on file with the undersigned. Some of the bone and other material examined had an odor reminiscent of fuel. The only soft tissue present was a small amount of muscle tissue sent to the FBI for mtDNA analysis along with some long bone fragments.

**Age Estimation:**

All cranial fragments identified are of adult dimensions and the epiphyses of the radius and femur heads are completely fused; no degenerative arthritic lipping is noted on the radius or (incomplete) femur heads. The single-rooted tooth found on November 10, 2005 exhibits a closed root apex as does the mandibular molar found within its bony socket. Even given the fragmentary and burned nature of these remains, it is highly likely that this individual is less than 30-35 years of age.

**Sex Estimation:**

The radial head diameter measures 18.33 mm (Berrizbeitia 1989) and the fragmentary femur shaft circumference measures approximately 78.0 mm. Sharp orbital and supraorbital margins were also identified. The left clavicle shaft dimensions are 9.7 mm (sagittal) and 9.5 mm (transverse). Even given the fragmentary nature of these remains and the documented heat-induced dimensional changes experienced by burned bone (Thompson 2005), it is the opinion of the undersigned that the remains presented for analysis are those of a female.

**Stature:**

*Given the degree of bone loss and extreme fragmentation of the long bones, it is not possible to provide an estimate of stature.*

**Ancestry:**

*Given the degree of fragmentation to the skull and face, it is not possible to assess ancestry.*

**Time Since Death:**

*The presence of empty pupal casings (Tag # 7964, collected November 12, 2005 from Barrel #2 and identified as, "Burnt bone pieces") suggests that, perhaps, there was an undocumented interval between Ms. Halbach's death and the burning episode when her remains may have been exposed to egg-laying flies. However, it is not possible to determine from this analysis if those pupal casings were associated with the human or non-human fragments identified by the undersigned as collected under that Tag number. It is worthy of note, however, that the same evidence (Tag) number yielded the suspected human bone fragment with evidence for multiple cuts.*

**Pathologies/Anomalies:**

*None identified.*

**Cause/Manner of Death:**

*There is an unambiguous semi-circular cranial defect on the internal table of a left parietal bone fragment that exposes the diploe (the spongy bone between the internal and external tables of the skull); the internal diameter of the defect is larger than the opening on the outside of the skull fragment that exhibits a crescent-shaped defect with evidence for slight external beveling. A second, smaller, parietal fragment articulates with the larger fragment but does not complete the defect. Because of the overall skull fragmentation, it may never be possible to reconstruct the entire defect unless additional opposing cranial fragments are identified in as yet unexamined material. X-rays taken of this larger fragment document the evidence of four very small objects of considerably greater density than the bone itself adjacent to the defect. At my suggestion, and at the request of S/A Fassbender, Mr. Ken Olson of the Crime Laboratory in Madison was asked to perform energy dispersive X-ray (EDX) analysis on the fragment in order to assess elemental composition of those small radiopaque particles. Mr. Olson contacted me by telephone on February 27, 2006 to let me know that his analysis identified lead on the outer cranial table of the larger fragment proximate to the internally beveled defect.*

*Internal beveling is often considered to be one of the most important signatures of an entrance wound to the skull and the orientation and differential angulation of the defect on the internal table of the skull may sometimes (depending on the thickness of the bone) help estimate the direction of fire; the forensic literature also describes such*



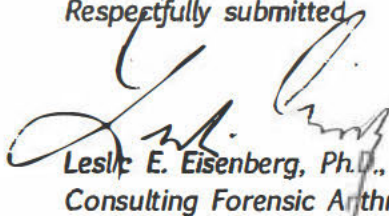
beveling with respect to exit wounds, although this feature is much more often the exception than the rule (Bhoopat 1995, Quatrehomme and Iscan 1998, 1999). In this case, because the entire defect cannot be reconstructed it is not possible to provide either an estimate of the direction of fire, or the relative position of the body when the injury was sustained. At this time, no exit wound has been described but additional reconstruction of cranial fragments is ongoing and may yield additional information. Even in completely circumscribed defects, caliber size is often impossible to determine (Berryman *et al.* 1995).

Further anthropological analysis will focus on the cut marks documented on several bone fragments since it is well known that preexisting traumatic injury can be identified and distinguished, even in burned or cremated bone (de Gruchy and Rogers 2002, Herrmann and Bennett 1999, Pope and Smith 2004). With additional work it may also be possible to distinguish heat-related from possible antemortem/perimortem fractures to the cranial and postcranial remains.

**Provisional Conclusions:**

The anthropological examination and laboratory analysis completed to date has identified the burned and extremely fragmented human remains as those of an adult female less than 30-35 years of age. It is not possible to estimate ancestry or stature at this time given the degree of bone fragmentation and destruction due to the burning episode. A deliberate attempt was made to obscure cause and manner of death through burning. At this time, the individual whose remains were presented for forensic anthropological examination and analysis should be considered a victim of homicidal violence. All information in this report is subject to review and modification as additional analysis is performed and more information becomes available.

Respectfully submitted,



Leslie E. Eisenberg, Ph.D., D-ABFA  
Consulting Forensic Anthropologist

Dated: 4 July 2006

Enclosures: Three-page evidence transmittal report dated November 17, 2005 (mtDNA).

Cc: Kenneth A. Bennett, Ph.D., Forensic Anthropologist  
Thomas Fassbender, Special Agent, Wisconsin Department of Justice  
Jerome Geurts, Director, Wisconsin State Crime Laboratory-Madison  
Laura Gioeni, Federal Bureau of Investigation, mtDNA Laboratory  
James Holmes, Special Agent, Wisconsin Department of Justice

Kenneth R. Kratz, District Attorney, Calumet County  
Gerald Mullen, Special Agent, Federal Bureau of Investigation (Green Bay)  
Rodney Pevytoe, Special Agent, Wisconsin Department of Justice (Arson Bureau)  
Donald O. Simley II, D.D.S., Forensic Odontologist  
John Stanley, Dane County Coroner  
Michael A. Stier, M.D., Forensic Pathologist, University of Wisconsin Medical School  
Mark Wiegert, Investigator, Calumet County Sheriff's Office

### References Cited

- Bass, W.M. and R.L. Jantz  
2004 Cremation weights in East Tennessee. *Journal of Forensic Sciences* 49(5): 901-904.
- Berrizbeitia, E.L.  
1989 Sex determination with the head of the radius. *Journal of Forensic Sciences* 34(5): 1206-1213.
- Berryman, H.E., O.C. Smith, S.A. Symes  
1995 Diameter of cranial gunshot wounds as a function of bullet caliber. *Journal of Forensic Sciences* 40(5): 751-754.
- Bhoopat, T.  
1995 A case of internal beveling with an exit gunshot wound to the skull. *Forensic Science International* 71(2): 97-101.
- De Gruchy, S. and T.L. Rogers  
2002 Identifying chop marks on cremated bone: A preliminary study. *Journal of Forensic Sciences* 47(5): 933-936.
- Herrmann, N.P. and J.L. Bennett  
1999 The differentiation of traumatic and heat-related fractures in burned bone. *Journal of Forensic Sciences* 44(3): 461-469.
- Pope, E.J. and O.C. Smith  
2004 Identification of traumatic injury in burned cranial bone: An experimental approach. *Journal of Forensic Sciences* 49(3): 431-440.
- Quatrehomme, G. and M.Y. Iscan  
1998 Analysis of beveling in gunshot entrance wounds. *Forensic Science International* 93(1): 45-60.

Quatrehomme, G. and M.Y. Iscan

1999 Characteristics of gunshot wounds in the skull. *Journal of Forensic Sciences* 44(3): 568-576.

Thompson, T.J.U.

2005 Heat-induced dimensional changes in bone and their consequences for forensic anthropology. *Journal of Forensic Sciences* 50(5): 1008-1015.

Warren, M.W. and W.R. Maples

1997 The anthropometry of contemporary commercial cremation. *Journal of Forensic Sciences* 42(3): 417-423.