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Identification of the Fragmentary, Burned Remains of Two U.S. Journalists Seven Years After Their Disappearance in Guatemala

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ABSTRACT: The contribution of a physical anthropologist to a forensic investigation is generally associated with analysis of skeletal remains in a laboratory. This case, which deals with the identification of two U.S. journalists who disappeared in Guatemala in March 1985, shows that the observations of a physical anthropologist in the field—at the site where the skeletal remains are located—can be essential to the success of an investigation. In this case, there was a deliberate attempt to mislead the investigators, but the physical anthropologists on the team discovered the deception. Subsequently, when they were taken to the actual cremation site, they obtained bone fragments and teeth that permitted identification of the victims. For one individual, the unusual morphology of the frontal sinus made positive identification possible. Comparison of premortem dental X-rays with teeth found at the site resulted in positive identification of the second individual.

KEYWORDS: physical anthropology, human identification

Late in March 1985, a freelance journalist (N. C. Blake) and a photographer (G. W. Davis) from the United States disappeared in the northwest highlands of Guatemala, a rugged area of thick forest, ravines, and rough trails along the slopes of the highest mountain range in Central America, the Cordillera de Cuchumatanes. This section of the country was dangerous because of the ongoing conflict between guerrillas and the Guatemalan military and civilian patrols. Blake and Davis wanted to go there to interview guerilla leaders, though the U.S. Embassy, the Guatemalan military, and mayors of local settlements had told them that the area was unsafe. In April, after friends reported their disappearance, the U.S. Embassy investigated and concluded that the two probably had been killed or captured by the guerrillas, or were remaining with them by choice. Over the ensuing seven years, additional investigations, most undertaken or stimulated by Blake's two brothers, resulted in the following account of the events immediately preceding the disappearance of Blake and Davis.

On 26 March, the two men left Huehuetenango, capital of a department of the same name, by bus and traveled to the town of San Juan Ixcoy. They left San Juan on foot that afternoon, indicating that they intended to hike along the north face of Los Cuchu-

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matanes to Nebaj, some 40 km distant. They arrived in the settlement of San Francisco Las Flores in late afternoon on the 26th and spent the night there, leaving the next day for Mixlaj, where they arrived in mid-morning. They told the local mayor that they wanted to go to Sumal, a mountaintop stronghold of the guerrillas. The following morning, 28 March, they left Mixlaj, traveling toward the Guatemalan military base in Las Majadas, which overlooks a number of nearby small settlements. Blake and Davis stopped in one of these settlements, El Llano, and representatives of the civil defense force there reported their presence to a lieutenant at Las Majadas. The lieutenant stated that the two men should not go to Sumal but gave permission for them to go instead to Salquil Grande (a Guatemalan Army stronghold where, presumably, they would be safer than in guerrilla-held territory). He instructed the El Llano civilian patrol to escort the two men to the Huehuetenango/El Quiche departmental border. Whether Blake and Davis left El Llano with several members of the civilian patrol on the morning of 29 March or 30 March is not clear, but in any case, they never arrived in Salquil, nor at their initial stated destination of Nebaj, nor in any other settlements in the vicinity.

A school teacher who investigated their disappearance at the request of Blake's brothers reported in 1988 that the two men had been escorted by several members of the El Llano civilian patrol to a nearby area to the east called Los Campomentos where logging operations in the surrounding forest were taking place. Davis was shot once, and Blake twice; the bodies were thrown next to the trail and covered with logs and woodcutting debris. Their possessions (for example, cameras, recorder, backpacks, money [American and Guatemalan], articles of clothing) were taken. According to the teacher, the motive for the murders was primarily greed, plus the fear that the money Davis and Blake carried might fall into the hands of the guerrillas.

The school teacher also reported that some two years after the murder, when the U.S. Embassy conducted further investigations, an order came from the military base in Huehuetenango to find and burn the remains and remove any proof of the incident. Five civilian patrolmen, three from Las Majadas and two from El Llano, carried out the order. They dug a hollow about one kilometer from the place where the men were murdered, covered the skeletons and any associated artifacts with logs, and built a fire to destroy evidence of the murders.

Early in 1992, the Blake brothers and a representative of a private relief organization reached an agreement with the civil patrol commissioner for the region where El Llano is located. This man said that he would have the remains of Blake and Davis located, excavated, and shipped to the United States in return for assurance that the family would not prosecute and for a sum of money to be paid if the remains could be positively identified.

The Blakes then requested D. W. Owsley of the Smithsonian Institution's Department of Anthropology to examine the contents of two wood crates alleged to contain soil and the burned remains of Davis and Blake and, if possible, to identify the remains. Owsley agreed, and on 27 March 1992, the two crates were delivered to the National Museum of Natural History.

Examination and Preliminary Analysis

The first step in the examination was to screen the soil contained in the crates through 1/8-inch wire mesh and to separate fragments of bone and metal from the dirt and plant material (roots, charred bits of wood). The soil was then divided among 25 large, numbered, plastic bags. Each quadrant of each bag received a letter designation—A, B, C, or D. Each bag was X-rayed and the film examined to detect small radiopaque particles that had passed through the screen. After fine screening and sorting, these particles, many of them zipper teeth, were identified by bag of origin, and several were selected for

further analysis (scanning electron microscopy and energy dispersive X-ray) by the FBI. The particles included two metal fragments that were embedded in bone, another metal fragment, and a fragment whose substance could not be determined from radiographic examination. Neither of the fragments in bone were from bullets or dental fillings; one was aluminum, and the other, aluminum and silicon. The other metal fragment was brass (copper and zinc), and the remaining fragment was wood. Other metal artifacts found with the remains included a wire-type tent stake, rusted and blackened by fire, and a tack.

Many metal fragments were small and irregularly shaped; those larger than a 1-mm cube were submitted to the Smithsonian Conservation Analytical Laboratory for X-ray florescence elemental analysis. The principal elements found were copper, zinc, iron, and molybdenum. Also present were calcium, chromium, lead, manganese, potassium, strontium, titanium, and, possibly, bismuth.

Bone recovered from the soil consisted of 1610 calcined fragments weighing 998.2 g. That these fragments represented two individuals was apparent from duplication of elements, for example, corresponding pieces of two frontal and occipital bones and three zygomatic bones. Although both sets of remains represented only an exceedingly small percentage of each individual, it was also possible to determine that they were adult males of different ages. The majority of the fragments consisted of the cortex of long bones, including femora, fibulae, tibiae, humeri, ulnae, and radii. Fragments of two vertebrae and one right rib were also present. Fewer cranial than postcranial bone fragments were present; these included a few mandibular fragments.

The bone fragments could be sorted into two general categories based on color. One set was gray-white with greenish tinges, and the other was yellowish. Dr. Jim Krakker (Smithsonian Institution) evaluated the range of color variation within each set by means of Munsell Soil Color Charts (Munsell Color, MacBeth Division of Kollmorgen Corporation, Baltimore, MD, 1973 edition). When samples of white and yellow cortical bone were subjected to X-ray florescence elemental analysis, the elemental composition was identical, thus suggesting that some innate organic difference in, for example, body fats or oils, of the two individuals led to a difference in color when burned.

Owsley believed that if he could visit the site (or sites) where the murder and burning of the remains had taken place, he could obtain additional bone fragments and possibly teeth to aid in identifying the victims. The excavators were untrained and had worked hurriedly in the rain. It was likely that they had missed, or had not bothered to excavate, all the bone fragments and artifacts that were present. Therefore, in June 1992, at the invitation of the U.S. Embassy, Owsley went to Guatemala. The Blake brothers accompanied him, as did Dr. John Verano, a physical anthropologist and colleague at the Smithsonian.

Search for the Site

Col. Allen Cornell, Military Attache, U.S. Embassy in Guatemala, and Lt. Col. Otto Noack, Human Rights Officer, Guatemalan Army Directorate of Intelligence, provided logistical support to the investigating team (viz., the two physical anthropologists, the Blake brothers, one journalist, and two photographers). The group flew to Nebaj where the civilian patrol commissioner, Felipe Alva, met them and, with several of his patrolmen, accompanied them on the drive to Palob. The team then hiked more than two hours into a rugged, mountainous area. One of Alva's men, who allegedly had participated in the excavation of the burned skeletal remains, served as guide. When the group arrived at a small valley planted in corn and potatoes, the guide moved ahead, closely followed by Verano. He led the team to a burned, uprooted tree stump in the center of the field. Owsley began troweling the area indicated by the guide while Verano screened the dirt. The topsoil was dark; it contained some bits of charcoal but no bone fragments. About

15 cm below ground surface, Owsley found undisturbed clay soil. The guide reached down and presumably picked up a small, green, plastic bag that he claimed contained dirt and bone fragments left behind in March. Owsley and Verano screened soil from the plastic bag and found 15 fragments of bone similar in color and degree of burning to the skeletal material sent earlier to the National Museum of Natural History. The bag also contained small lumps of reddish clay like those present in soil examined at the Smithsonian. Owsley dismissed this site as the actual location for the following reasons:

1. The burned area was too small.
2. The amount of ash and charcoal present was inconsistent with the extensive burning evident in the skeletal remains.
3. The middle of a field, with an insufficient quantity of wood readily available, was not only an unlikely location but did not correspond to the information the Blakes had obtained from the school teacher about the site of the murder and subsequent burning of the remains.
4. The type of soil and lack of plant roots differed from the soil containing burned bone that had been submitted for analysis in March, as well as from the soil in the plastic sack that the guide claimed had been left behind in March.
5. The soil contained no bone fragments. (As the excavators allegedly had dug hurriedly with machetes, it was highly unlikely that they recovered every piece of bone.)

Further, in regard to the plastic sack, it was in good condition and showed no signs of weathering, such as would be consistent with exposure at this location for nearly three months. It was also unlikely that, when 150 pounds of dirt were excavated and shipped in March, one eight-ounce bag was left behind because there was no room for it. The bag must either have been recently placed at the site or carried in by the guide in an attempt to "seed" the site, which he was unable to do with Verano so close at his heels.

Based on these findings and arguments, Col. Cornell, Lt. Col. Noack, and the Blakes confronted and further interrogated Alva, who finally agreed to go with them to El Llano to try to get the local inhabitants to lead them to the burn site. Soldiers from the Army base at Huehuetenango accompanied them to El Llano. As a result, two days later the investigators flew by helicopter to an area on the side of a hill about 1.5 miles east of El Llano where numerous large trees had been felled. In the center of a burned area, soil had been recently removed. This hollow contained a large quantity of charcoal and plant roots. It had been partially covered by a layer of orange clay deposited on top of a layer of ash.

Owsley systematically excavated the site, screening some soil but bagging more to screen back in Guatemala City. The previously disturbed portion was removed first, then the perimeter. He recovered burned bones and teeth, as well as artifacts, including 12 tent stakes, one lens of an eyeglass and part of the frame, numerous pieces of melted aluminum, some tubular in shape and probably remnants of tent poles, five distorted tent line fasteners, one stamped "Made in England," and pieces of iron and brass. The Blakes identified the eyeglass frame as the same type owned by their brother.

Calcified bone recovered from the site included 523 fragments weighing 454 g. When combined with the previously excavated material, the number of bone fragments for analysis now amounted to 2133, a total weight of 1452 g. Although neither skeleton was anywhere near complete, among the bone fragments were some with distinctive characteristics that later made positive identification possible.

Positive Identification

Analysis of the calcined bone fragments indicated that two, adult, male individuals were present. Determination of sex was based on the degree of development of the

supraorbital torus (located on the frontal bone) and of the external protuberance and nuchal ridge of the occipital. The well-defined linea aspera on fragments of femora also suggested that sex was male. Both of Blake's mandibular third molars were recovered, and the roots were fully formed, with complete apex closure. Sutures of the corresponding set of cranial bones were open both endocranially and ectocranially, which is consistent with an age range of 20 to 30 years. Blake was 27 at the time of his death. The second set of cranial bones showed varying degrees of suture obliteration; a suture on one fragment was visible ectocranially but had completely closed endocranially. Another showed both endocranial and ectocranial closure. Thus the second individual was older; Davis was 38 at the time of his death.

Antemortem records available for Davis included a dental chart, five bitewing X-rays, and skull X-rays dating from 1981 when he had fractured his left mandible; those obtained for Blake included several bitewing X-rays, the most recent dating from 1980, and clinical records related to an automobile accident in 1978. Comparison of recovered bone fragments and teeth with the radiographic data was a key step in identifying the victims. Particularly helpful were two of the Davis X-rays showing Waters (modified posterior-anterior) views of the skull. The primary features visible were both orbits, the maxillary sinuses, and the frontal sinus, which in Davis was large. As Fig. 1 shows, the frontal sinus is asymmetrical, with the right side larger than the left. The superior borders

FIG. 1—*Radiograph showing the frontal sinuses and frontal crest morphology of G. W. Davis.*

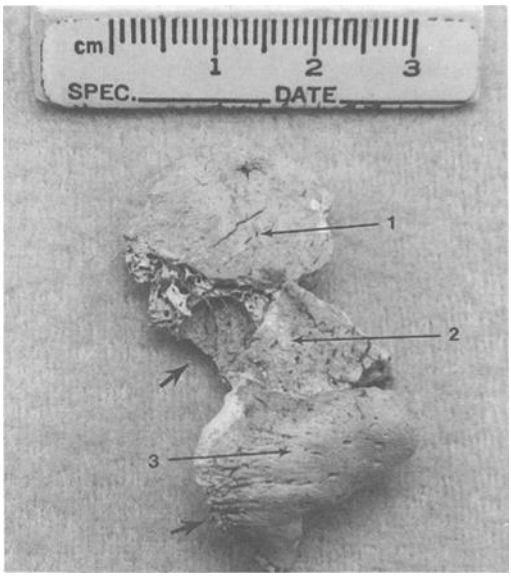

FIG. 2*a*—*Ectocranial view of three matching bone fragments (1, 2, 3) of Davis's frontal bone. The lower arrow indicates the midline landmark nasion. The upper arrow identifies a centrally positioned lobe of the right frontal sinus.*

are scalloped. In the midline, above the nasion (that is, intersecting point of the naso-frontal suture with the median anteroposterior plane), a well-defined groove, or sulcus, runs up the frontal, fading approximately at the location of the hairline. This sulcus is narrow, with well-defined lateral margins on the interior surface of the frontal bone, and it is clearly visible on the antemortem X-ray where it overlaps one lobe of the right frontal sinus. The area of the cranium containing this lobe of the frontal sinus and the frontal crest was represented by three fragments of frontal bone from the skeletal remains

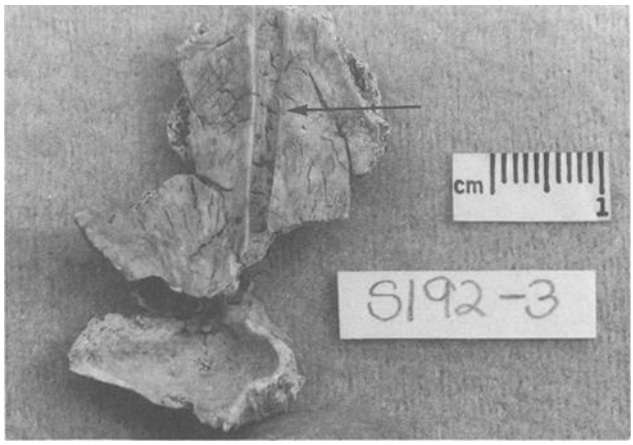

FIG. 2*b*—*Endocranial view of the three bone fragments showing a well-defined sulcus in the frontal crest.*

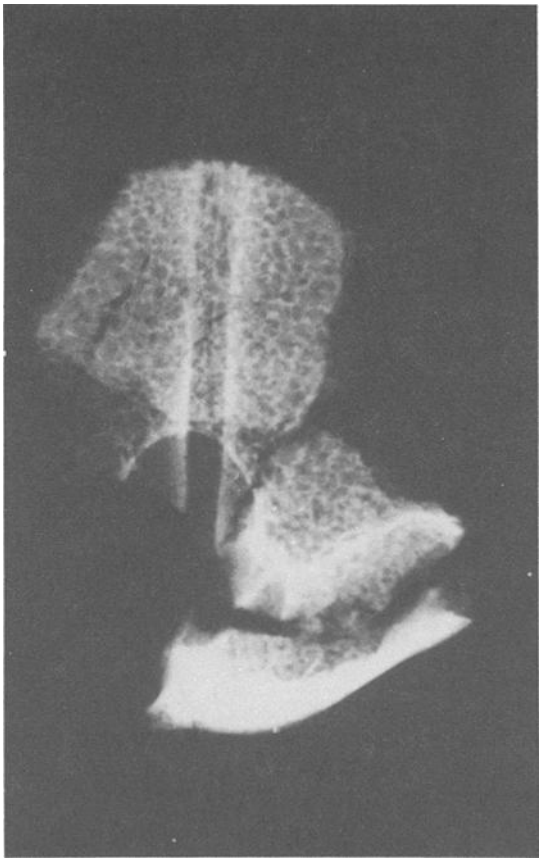

FIG. 3—*Radiograph of the three bone fragments from Davis's frontal showing anatomical details of the frontal crest and frontal sinuses that match the antemortem radiograph shown in Fig. 1.*

that could be pieced together (Figs. 2*a* and 2*b*). When united, they comprised a section that is visible in the antemortem X-ray (Fig. 1). Figure 3 presents a radiograph of this frontal bone specimen. Unique details of frontal crest and sinus morphology are visible both antemortem and postmortem: (a) a well-defined sulcus in the frontal crest overlaps a centrally placed lobe of the right frontal sinus; (b) details in the shape of the left frontal sinus match exactly; and (c) the relative heights of the centrally positioned lobe and the left sinus are consistent. In addition, anatomical characteristics of the left and right zygomatic bones match; for example, the lateral border of the frontal process of the left zygomatic bone has a prominent projection that is visible in the antemortem radiograph. The supraorbital ridges, visible in lateral X-rays, are well developed, and the same morphology is evident in the bone specimen.

To check the degree of variability in internal frontal crest morphology and the possibility of a coincidental match, 350 crania of black and white males and females were

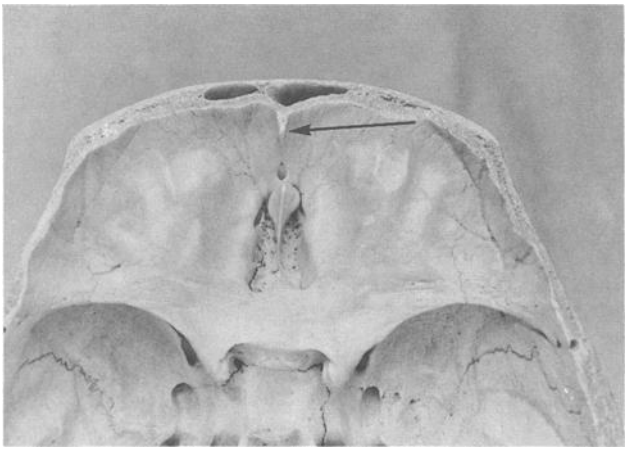

FIG. 4—*Type 1 frontal crest morphology showing a pronounced single ridge sloping upward from the foramen caecum.*

examined. These crania came from the Terry Collection of 1636 skeletons (formerly assembled by Robert J. Terry at Washington University, St. Louis, and now at the Smithsonian), long a key resource for comparative forensic analyses). Five types of frontal crest morphology can be identified; three of these occur so seldom that they were combined into one category in the comparative analysis. Type 1 is essentially a pronounced, thin, single ridge sloping upward from the foramen caecum to form a peak (Fig. 4); Type 2 (the type characterizing the Davis X rays and bone specimens) displays a sulcus aligned with the foramen caecum and bordered by parallel ridges (Fig. 5). The "Other" category in this analysis included a roughly hour-glass shaped frontal crest, a short central ridge in the crest that widens into a bulb shape, and the absence of a frontal crest.

Table 1 presents the data on frontal crest morphology. In white males from the Terry

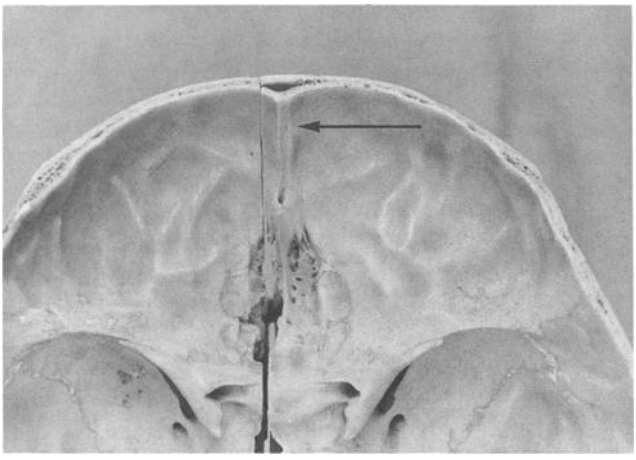

FIG. 5—*Type 2 frontal crest morphology showing a sulcus aligned with the foramen caecum and bordered by parallel ridges.*

TABLE 1—*Occurrence of different types of frontal crest morphology in white and black, male and female skeletons represented in the Terry collection (Smithsonian Institution) (N = 350).*

Sample	Frontal Crest Morphology		
	Type 1[a]	Type 2[b]	Other[c]
Males			
White (N = 100)	88 (88%)	9 (9%)	3 (3%)
Black (N = 100)	82 (92%)	6 (6%)	2 (2%)
Total[d] (N = 200)	180 (90%)	15 (7.5%)	5 (2.5%)
Females			
White (N = 75)	53 (70.7%)	18 (24%)	4 (5.3%)
Black (N = 75)	68 (90.7%)	6 (8%)	1 (1.3%)
Total (N = 150)	121 (80.7%)	24 (16%)	5 (3.3%)

[a]Prominent single ridge extending superiorly from foramen caecum.
[b]Sulcus present bordered by parallel ridges.
[c]Hourglass or bulb shape or frontal crest absent.
[d]Male versus female: Chi-square = 6.6; DF = 2, P = 0.04.

Collection, the incidence of Type 1 was 88%, of Type 2, 9%, and of other crest morphology, 3%; for black males the corresponding percentages were 92, 6, and 2. A total of 71% of the white females in the sample displayed Type 1, as did 91% of the black females; the percentages for Type 2 were 24 and 8, respectively. These findings indicated that the frontal crest morphology characterizing Davis would be likely to occur in only about 9% of white males.

As an additional check on the findings, a random series of 115 cranial radiographs were examined to determine how frequently the combination of double-ridged frontal crest and an overlapping frontal sinus lobe occurred; of these 115 radiographs, only nine (7.8%) displayed such morphology.

Green (fresh) bone that has been burned in a fire shrinks [*1–3*]. The vault thickness of the Davis frontal bone fragments was between 3.0 and 4.0 mm. Comparable measurements of a sample of 18 white males of similar age from the Terry Collection yielded an average vault thickness of the frontal bone above the cranial landmark glabella of 6.4 mm (S.D. = 1.7 mm). If Davis's frontal bone was approximately average in thickness, then shrinkage of as much as 35% occurred.

Morphological characteristics of the frontal sinuses are frequently used to establish personal identification [*4–6*]. As demonstrated, the potential for identification based on frontal sinuses remains even after calcination of the bone.

In one section of the burn site visited in June, there were several skull fragments, parts of a mandible (left gonial angle, symphysis, and left condyle), and several teeth. The teeth could be associated with Blake, for there were many characteristics that were not consistent with the antemortem X-ray data for Davis. Davis's left mandibular third molar was not impacted, and a right mandibular third molar was not visible in his X-rays, suggesting antemortem loss or congenital absence. Of two mandibular third molars (right and left) recovered from the burn site, the right had associated alveolar bone showing that it was impacted, as Blake's dental records showed his had been. Further, the right mandibular second molar found at the site had a distal root concavity below the cemento-enamel junction that resulted from pressure erosion caused by the impacted third molar. This concavity was visible in Blake's antemortem X-rays.

Dental restorations in recovered molars were inconsistent with Davis's dental data; however, the crowns of the right mandibular first and second molars matched Blake's antemortem record for dental restorations in these teeth. Further, the pulp chambers of the right mandibular first and second molars in the Davis X-rays appeared constricted and differed in shape from those in the teeth from the burn site and in antemortem records for Blake. Detailed examination of the characteristics of the pulp chambers and root morphology of molars found at the site and antemortem X-rays for Blake revealed consistency in size and shape. In addition, the dentin morphology of the two mandibular third molars showed five cusps, as did Blake's antemortem X-rays.

Based on the correspondence of antemortem radiographic data with, for Davis, frontal crest morphology in specimens from the burn site, and for Blake, characteristics of teeth, it was possible to identify both these individuals who had been missing for seven years.

Conclusion

This case shows that even in instances of extreme fragmentation and calcination of bone, positive identification can be achieved. In addition, it demonstrates the benefits of interdisciplinary cooperation, which in this instance included the FBI Laboratory and the Smithsonian Conservation Analytical Laboratory, both of which participated in the analysis of metallic objects from the site. In particular, the case illustrates the value of comparative collections in providing basic population data. Through comparison with, for example, skeletons from the Terry Collection, a better understanding of variability in human anatomy can be achieved, and in this case, confidence in a personal identification strengthened. Primarily, however, the case shows the value of having a trained physical/forensic anthropologist in the field participating in the recovery of remains. As R. R. Blake (brother of one of the victims), indicated in a 23 July 1992 letter to the Director of the National Museum of Natural History: "Their [the physical anthropologists'] expertise was critical in exposing a fake site which we were led to by our civil patrol contact. Their presence allowed us to refute decisively this person's ploy so that we could get to the actual site several days later. If they had not been present, we may not have found the real location. . . ."

Acknowledgments

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