TO: Dr. William M. Bass, State Forensic Anthropologist

FROM: Gregory A. Bunch, Student in Forensic Anthropology

SUBJECT: Identification of human remains

FORENSIC ANTHROPOLOGY CASE NO.: 92-5

DATE: February 25, 1992

On February 14, 1992, at approximately 10:50 a.m., I received from Dr. Bass the skeletal remains which I was to identify. The results of my findings are listed herein.

SEX: Male

AGE: 45 to 55 years within a 45 to 65 year category

RACE: Caucasoid (white)

STATURE: Unable to be determined with skeletal elements present

TRAUMA: Entrance and exit wounds caused by two bullets. One bullet entered the skull from the back and exited through the right eye while the second passed through the skull from right to left. Puncturing and gnawing of the scapula by an animal has also occurred.

INVENTORY: (see Fig. 1.)

The remains represented are those of an older adult male in good condition. There is nothing that would indicate that the bones were buried at any time. Due to the postmortem gnawing damage found on both the right and left scapula, it is reasonable to assume that the remains were possibly transported by a scavenger at some point. The exact identity of the type of scavenger is undetermined, yet there are portions of both scapula, the most distal portion of the medial border of the left scapula (see Fig. 2.) and the most proximal portion of the medial border of the right scapula (see Fig. 3.), which show signs of puncturing most usually associated with canine or carnasial activity (Haglund et al., 1988).

Both the cranium and the scapula seem to have been somewhat exposed to the sun and are bleached to a certain degree. There are two patches of adherent tissue on the cranium (see Fig. 8.), one located on the left parietal bone just above and following the curvature of the squamosal suture, the other lying on the distal portion of the left coronal suture. There is also tissue in and around the glenoid cavities of both scapula.

The following skeletal elements are the only ones present: cranium; the left scapula; the right scapula; the mandible.

SEX:

The best way of assessing the sex of a human skeleton is by means of comparative morphology of the innominates (hip bones). Unfortunately these are not available for examination in this case. We must therefore rely on the use of discriminant function analysis to determine the sex. Using a method developed by Giles and Elliot (1962), the sex of an individual may be determined using five measurements taken from the individual's skull, in this case the skull of (92 - 5). The measurements, once taken, are entered into the equation derived by Giles and Elliot. This produces a numerical sum which may then be compared to set male and female limits to determine the sex of the individual. The execution of the aforementioned procedure follows.

Basion - Prosthion length		94.1 mm
Glabello - Occipital length		180 mm
Basion - Nasion length	103 mm	
Maximum byzygomatic	135 mm	
Prosthion - Nasion height		77 mm

$$-1.00\ (94.1) + 1.16\ (180) + 1.68\ (103) + 3.98\ (135) + 1.54\ (77) =$$
$$-\ 94.1 + 208.8 + 173.04 + 537.3 + 118.58 =$$
$$= 943.62$$
$$\mathbf{943.62 > 891.12 = MALE}$$
$$943.62 < 891.12 = \text{FEMALE}$$

Since the answer of the equation (943.62) is greater than 891.12, the subject in question (92 - 5) is determined to be a Male (Giles and Elliot, 1962).

The sex of an individual may also be determined using comparative morphology of the skull. The prominence of the supraorbital ridge (brow ridge) and the formation of an external occipital protuberance of the skull also indicate a male as well as the square nature of the jaw (Bass, 1987).

The measurement of the scapula may also be used to determine the sex of an individual (Dwight, 1894). It is being used here simply as a secondary means of sex determination. As stated by Dwight (1894), if the length of the scapula exceeds 160 mm in length and the length of the glenoid cavity of the scapula exceeds 37 mm in length, then the subject in question is determined to be a male. The measurements of the right scapula (92 - 5) were taken and the length of the scapula, even though partial, measured 161 mm which exceeds the 160 mm length set by Dwight. The length of the glenoid cavity (92 - 5) follows with a measurement of 37.2 which is also greater than the value set by Dwight therefore indicating and corroborating the determination that the subject (92 - 5) is indeed male.

AGE:

The estimation of age is best determined using an approach involving multiple indicators. Some of the indicators used are the pubic symphysis, dentition maturation, epiphyseal closure. Secondary indicators are often employed to back up the findings of the primary indicators. Some of the secondary procedures include: cranial suture closure, aricular surface analysis, and maxillary suture obliteration.

Due to the lack of pubic symphasis in this case this method could not be employed. The estimation of a maximum low age was obtained through simple study of epiphyseal closure of the scapula. The fact that the scapula had fused completely indicates that at the very least, the individual is 25 years of age (Bass, 1987). This is enforced by the dentition, in which the complete eruption of all of the teeth has occurred. The third molars appear to have possibly been congenitally absent and therefore may have never erupted. The eruption of all adult teeth would indicate that the age of the individual was at least 35 years of age (Bass, 1987).

There are signs of osteoarthritic lipping beginning to occur around the margin of the glenoid cavity of both scapula, and very slight lipping has begun on portions of the axillary and medial borders of both scapula. Lipping of this type generally does not occur until around the early thirties (Graves, 1922). The lack of prominent atrophic spots in the bodies of either scapula would indicate that the individual was probably not much older than 45 years of age due to the fact that these spots begin to occur more frequently after 45 years of age (Graves, 1922). Distortion, warping of the entire thickness of the body of the scapula, according to Graves (1922), occurs rarely before the fortieth year in any recognizable degree. There are signs of such distortion in both scapula bodies.

Looking at the sutures of the maxilla (Mann et al., 1987) an age of 50 + years was derived from the fact that most of the sutures had been partially obliterated even though the intermaxilliary suture is still not completely fused, and the palatomaxillary suture is still slightly visible. There also seems to be a certain degree of pitting that had occurred.

Using cranial suture closure as an age estimator (Meindl and Lovejoy, 1983) an age of 35 to 60 was obtained using all ten points of observation developed by Meindl and Lovejoy. This was accomplished by scoring the amount of closure of the ectocranial sutures which resulted in a total score of 17, this was then compared to the age relation chart provided. Scoring of just the five lateral- anterior sutures produced an age of 39 to 69 years of age. The total score for these sutures was 9, and was also compared with a chart provided by Meindl and Lovejoy. Together, the ages derived from the cranial suture closure method produced an average range of 37 to 65 years of age.

The combination of all of these factors gives an age range of 45 to 65 years with a smaller range of 45 to 55 years.

RACE:

Race can easily be determined using comparative morphology. The morphology of this skull (92-2) indicates it to be white by nature, showing little or no prothusion and be somewhat narrow in appearance (Bass, 1987).

Using cranial measurements (Giles and Elliot, 1962) the race was determined to be white. The following are the measurements obtained and the equation by which the determination was made. The numerical answer obtained is plotted on the graph (see Fig. 4.) , derived by Giles and Elliot, which allows for the answer to be differentiated as to race.

Basion - Prosthion length		94.1 mm
Glabello - Occipital length		180 mm
Maximum width		142 mm
Basion - Bregma height	141 mm	
Basion - Nasion length	103 mm	
Maximum byzygomatic	135 mm	
Prosthion - Nasion height		77 mm
Nasal width		22 mm

3.06 (basion - prosthion ht.)+ 1.60 (glabello - occipital length)
- 1.90 (maximum width) - 1.79 (basion - bregma) - 4.41 (basion - nasion ht.) - 0.10 (maximun diameter of the bi-zygomatic) +2.59 (prosthusion - nasion ht.) +10.56 (nasal width) = total (compared to chart on Fig.2.)

3.06 (94.1 mm) +1.60 (180 mm) - 1.90 (142 mm) - 1.79 (141 mm) - 4.41 (103 mm)- 0.10 (135 mm) + 2.59 (77 mm) +10.56 (22 mm) =

287.95 + 288 - 269.8 - 252.39 - 454.23 - 13.5 + 199.43 + 232.32 =
=17.78

STATURE:

Unable to determine with available skeletal elements.

DENTITION: (see Fig. 5.)

The teeth that are present are the first and second left maxilliar molars (#2 and#3); the right maxilliar first and second molars (# 14 and #15); the first and second right and first and second left maxilliar premolars (#4, #5, #12, #13); the left and right maxilliar canines (#6, and #11); the lateral and central left maxilliar incisors (#9, and #10); the right maxilliar lateral incisor (#7); the first and second left mandibular molars (#18 and #19); the first right mandibular molar (#30); and the left mandibular canine (#22). The fact that there seems to be no sign of eruption and therefore no real signs of healing where the maxilliar and mandibular third molars should be located, it may be speculated that the individual (92 - 5) may have been lacking his third molars for possible genetic reasons. Without an x-ray, it is impossible to be certain. A number of the teeth seem to be postmortem (after death) in loss and they include the right central maxilliar incisor (#8); the right second mandibular

molar (#31); the right first mandibular premolar (#28); the right mandibular canine (#27); the right lateral and central mandibular incisors (#26 and #25); the left lateral and central mandibular incisors (#23 and #24); the left first mandibular premolar (#21). The remaining teeth seem to have been antemortem (before death) in loss, this can be determined by the filled and smooth appearance of the aveolar bone where they were at one time located.

There are signs of periodontal disease in the form of alveolar ridge resorption (receding gum line) which occurs naturally with age. There are bulbous calcifications lying on the the alveolar process near the roots of the teeth. Seven teeth contain restoration in the form of silver amalgam which has been applied to caries. The left first mandibular molar (#19) seems to have been broken postmortem.

TRAUMA: (see Figs. 6, 7, 8, and 9.)

There is minimal yet most likely fatal trauma to the cranium in the form of two separate gunshot wounds to the cranium. There is no real way to determine which gunshot occurred first. One of the shots entered on the left posterior portion of the cranium just above the lambdoidal suture. It can be determined that this was a point of entry by the internal beveling (Peterson, 1991) around the hole. This particular bullet exited the skull through the right eye orbit causing quite a bit of damage to the fragile bones in and around both eye orbits. The entrance wound is oval in appearance, possibly due to the fact that the bullet may have been fired from a position not perpendicular to the skull and most likely from above, with its vertical length being 1 cm and its horizontal width being 7 mm. The second bullet which entered on the right anterior portion of the cranium located in the proximal portion of the temperal bone near the squasmosal suture is round in appearance possibly indicating a shot which may have taken place perpendicular to the cranial surface. The internal beveling of this hole was again the identifying “entrance “ mark (Peterson, 1991). The diameter of the entrance wound is 7.5 mm. This bullet exited on the left anterior portion of the cranium lying on the coronal suture between the frontal and parietal bones. The external beveling indicated this hole as an exit hole. The exit wound measured 1 cm at its vertical most points and 1.2 cm at its horizontal most pints, the shape is however asymmetrical. According to Peterson (1991), there are only a few recorded instances where an entrance wound may produce similar external beveling in the form of chipping which is caused either by the rotating of the bullet or by the “forceful” return of gases through the bullet hole. The occurrence of an externally beveled entrance hole is quite rare and the probability of mistaking an externally beveled entrance wound for an exit wound is small (Peterson, 1991). The size of the holes produced on entrance seems to indicate that the weapon used was most likely of a small caliber.

SUMMARY:

The partial skeletal remains of a 45 to 55 year old white male was presented for examination on February 14, 1992 at approximately 10:50 am. There are signs of trauma in the form of wounds to the cranium caused by two gunshots to the head. There are signs of

carnivore gnawing and puncturing on the scapula. The remains were most likely never buried. There is adherent tissue on both the cranium and the scapula.

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