



## Physical Anthropology Section - 2012

### H68 Contaminated Cremains? Evaluation of Biological Characteristics Derived From Ash Weight

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After attending this presentation, attendees will gain a better understanding of the value of anthropological assessments of cremated human remains. The goal of this presentation is to highlight methods used to evaluate whether suspected cremated human remains match the biological profile of the decedent.

This presentation will impact the forensic science community by providing awareness of the value of cremains weight in estimations of sex and assessment of other attributes of the biological profile.

The growing popularity of cremation in the United States has increased the likelihood of civil litigation involving commercial crematories and funeral homes.<sup>1</sup> Forensic anthropologists are often consulted to determine whether alleged cremains are in fact cremated bone and if aspects of the biological profile are consistent with the decedent. There are numerous limitations to the forensic analysis of cremains, due to the standard practice of pulverizing bone into small, unidentifiable fragments following cremation. Despite these challenges, several studies have documented a significant sex difference in average cremains weight, with males weighing approximately 1,000 grams more than females.<sup>2-5</sup> Sectioning points generated from cremains weights reported in these studies have shown reasonable predictive accuracy for sex estimation, although significant variation in average weights has been documented between regions.<sup>2,5</sup>

In 2011, the California State University, Chico Human Identification Laboratory (CSUC-HIL) was contacted by an attorney to examine a cremains case suspected of contamination. The family of the decedent notified the law office that a funeral home had misplaced an urn containing the remains of a relative (a 60 year-old male). After further legal inquiry, the funeral home claimed to have relocated the urn. Due to the family's suspicions, the law office contacted the CSUC-HIL to analyze the contents of the urn to determine whether the cremains are consistent with that of the decedent.

Upon receipt, the urn contained a conglomerated block of material, which was removed from the plastic bag liner and placed into aluminum trays. Using geological sieves (1/8 inch mesh) and a strong magnet for small ferromagnetic metal items (screws, staples, etc.), the contents were separated into either osseous or non-osseous material. The majority of the urn contents were non-osseous material having the consistency of damp sediment (e.g., concrete dust, sand, cat litter). Following removal of the osseous remains from the sieves, radiographs of the remaining material showed very little cremated bone had passed through the 1/8 inch mesh. None of the cremains showed diagnostic anatomy; thus, it was not possible to determine if the cremains were human or nonhuman in origin.

Several lines of evidence supported the initial suspicion of contaminated cremains. First, the urn's contents weighed 544.3g more than originally recorded in the cremation log. Second, the urn contents weighed 4,173.5g, with non-osseous material (e.g., sediment, metal, stones) comprising 86.4% (3,604g) of the total weight, the majority of which (85.7%; 3,575.3g) was sediment. Only the remaining 569.5g (13.6%) represented cremains, well below even minimum reported weights for both sexes. Third, based on the reported stature of 154.9cm for the decedent, cremains weight is predicted to be 2,021.8g using equations reported in Warren and Maples.<sup>4</sup> The predicted weight for the decedent's stature is less than one-half of the actual weight of the urn contents. Additional testing, including x-ray fluorescence and x-ray diffraction analysis, will soon be undertaken to chemically characterize the urn's contents.

The results of this study highlight the value of cremains weights in evaluating aspects of the biological profile, as well as in settling legal disputes regarding potentially contaminated cremains. Estimations of sex and other biological parameters in cremation litigation cases should be applied cautiously due to reported regional differences in mean cremains weights. Further, additional studies, such as x-ray fluorescence and x-ray diffraction, can also be used to aid in the distinction of bone from other non-osseous materials.

#### References:

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2. Bass WM, Jantz RL. Cremains weights in East Tennessee. *J Forensic Sci* 2004;49(5):901-904.
3. Sonek A. The weight(s) of cremains. Paper presented at the 44<sup>th</sup> Annual Meetings of the American Academy of Forensic Sciences 1992, Feb 21. New Orleans, LA.
4. Warren MW, Maples WR. The anthropometry of contemporary commercial cremation. *J Forensic Sci* 1997;42(3):417-423.
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#### Cremains, Biological Profile, Forensic Anthropology