H36 Forensic Significance Beyond Taphonomic Characteristics: Using Archaeological Context, Craniometrics, and Radiocarbon Dating

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The goal of this presentation is to demonstrate archaeological, craniometric, and radiocarbon approaches to assessing forensic significance to supplement the standard taphonomic interpretation.

The presentation will impact the forensic science community by addressing the often difficult task of assessing the forensic significance of skeletal remains and by providing alternative approaches beyond simply interpreting taphonomic characteristics.

In the absence of primary contextual information, the assessment of forensic significance of remains found in a medicolegal context becomes difficult and often focuses on the taphonomic characteristics observed on the remains. This presentation follows a case study of remains removed from their primary context prior to medicolegal involvement and shows alternative approaches to assessing forensic significance that may be used to supplement the standard taphonomic interpretation.

In the summer of 2011, skeletal remains were discovered in the Greenpoint section of Brooklyn, New York. The remains consisted of a partial cranium, partial mandible, and two cervical vertebrae, which were discovered during outdoor construction in a residential backyard. The remains were removed by the property owner prior to the investigation; however, the general area remained undisturbed. The property owner was not able to provide additional details at the time of the investigation and the temporal provenience of the remains could not be assessed. In order to assess the forensic significance of the remains, the archaeological context of the immediate vicinity was documented and interpreted, craniometric data were assessed with respect to secular variation, and isotopic values were examined with respect to bomb-derived radiocarbon.

Archaeological excavation of the scene provided data used to reconstruct the context and determined that the remains, and associated artifacts, likely came from a secondary deposit within a shallow man-made depression. The associated diagnostic artifacts included: glass bottle fragments, a ceramic pipe stem fragment, a ceramic button, and a machine-cut copper nail. Although the pipe stem may date to the 18th or 19th-century, most of the artifacts were in use during the early 20th-century. The absence of modern debris within the discreet deposit suggests that the deposit was likely created more than 50 years ago.

Previous research has noted a secular trend toward higher, longer vaults and narrower vaults and faces in American crania and that cranial variables exhibit a high correlation with the birth year of the individual.[1,2] Accordingly, an analysis of the craniometric variables may assist in addressing the temporal origin of unknown skeletal remains. In this case, discriminant function analyses were performed using FORDISC 3.1 on the available measurements of the cranial vault using "19th-century" groups from the Terry and Todd Collections and "modern" groups from the Forensic Databank.[3] When tested against modern groups, the skull did not classify as being a typical member of any of the groups. When tested against White and Black groups of both sexes from the 19th-century and modern groups, the skull grouped most closely with Black females from the 19th-century.

Samples from the right parietal and left lower canine were extracted for radiocarbon analysis. Results indicated that the remains did not contain bomb-derived radiocarbon clearly indicating the individual lived and died before 1955. More precise radiocarbon dating in the five centuries before 1950 is hindered by natural fluctuations in environmental radiocarbon levels, but this case presented the possibility for refinement. The radiocarbon level in tooth dentin was found to be statistically different from that in enamel. Tooth dentin remodels throughout life but tooth enamel does not, so differences in radiocarbon levels can appear as a person ages. Here, the osteological age estimate of the individual was coupled with the enamel and dentin measurements in order to derive an environmental radiocarbon level rate-of-change. The derived rate-of-change was then matched to the known environmental rates-of-change over the past five centuries and, thus, the remains were tentatively assigned to a more specific time frame than would otherwise be possible. In this case, two solutions were found; either the 17th-century or early 19th-century.

References:

1. Jantz RL, Meadows Jantz L. Secular change in craniofacial morphology. Am J Human Biol 2000;12(3):327-38. 2. Jantz RL. Cranial change in Americans: 1850-1975. *J Forensic Sci* 2001;46(4):784-7.
3. Jantz RL, Ousley SD. FORDISC 3.0: personal computer forensic discriminant functions. Knoxville (TN): The University of Tennessee, 2005.

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