A62 Using the Geographic Information System (GIS) to Distinguish Between Human and Non-Human Cranial Bone Fragments

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After attending this presentation, attendees will be aware of the utility of GIS in the distinction between human and non-human cranial fragments. The method presented shows an innovative application of the geographical system, which was used to measure the sutures pattern and the bone curvature of human and non-human skulls, with the goal of creating a database that can be used for a quick identification of small cranial fragments.

This presentation will impact the forensic science community by demonstrating that GIS, a system usually used to manage geographic data, can be a useful tool for the differentiation between human and non-human fragmented cranial bones, with the advantage of being a cheap and non-destructive method that can speed up the identification process.

Cranial bone fragments can be found isolated in forensic contexts, such as fatal fires and mass disasters. In some instances, when bone fragments are present, police will call upon the anthropologist to understand if they are human or not. Whether the bone is confidently assigned as human or not will have repercussions for the investigation and will affect cost and time spent in the investigative process. Indeed, some small cranial bone fragments can present a real challenge for anthropologists and as many methods as possible must be used in order to establish their human or non-human origin.

Human and non-human crania, both juvenile and adult, were employed for the GIS measurements. The animal species chosen for the study were fox, cattle, and sheep. The skulls of these animals may be problematic if found fragmented, because they share some characteristics with human ones. For example, the parietal bone of the fox and calf has a curvature similar to that of humans, and fox and sheep cranial sutures may resemble some of the human skull sutures. Furthermore, these animals were selected because they are commonly found in the United Kingdom.

This presentation details the results of the analyses made on crania with GIS, demonstrating its potential in this aspect of forensic anthropology. Selected cranial sutures of all the skulls were mapped, and the curvature of specific cranial bones was measured. The measurements were then entered into a database. When cranial bone fragments are found, the sutures (if present) can be scanned and compared to the ones present in the database in order to ascertain if they are of human or non-human origin; the same process can be applied when measuring and comparing the bone curvature.

Though variations can occur, particularly related to age and/or pathological conditions, cranial sutures and curvature tend to follow a specific pattern in both human and non-human skulls. Therefore, they can be measured and compared with GIS, which was demonstrated to be a useful, fast, and non-destructive tool for the distinction between human and non-human cranial bone fragments in forensic anthropology.

Bone Fragments, GIS, Forensic Anthropology