H43 Predicting the Location of Scattered Human Remains: When Will Heads Roll and Where Will They Go?

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Attendees of the presentation will be able to identify the slope at which fleshed and skeletonized heads will begin to roll downhill in a forensic setting.

This presentation will impact the forensic community by providing Information useful to identify when it is feasible for investigators to identify slope as a factor in the distribution of skeletal remains, as opposed to other vectors such as carnivores. Additionally, GIS technology will be applied to the data to recognize potential for modeling the predicted final deposition of skeletal remains.

The skull is one of, if not the, most forensically significant skeletal elements in the human body. Whether it be through assessment of non-metric traits, or through the more complex collection of craniometric data, the skull provides the only reliable information for assessing ancestry. It can be used in the assessment of both sex and age, when the pelvis is either unavailable or ambiguous. The maxilla and mandible house the dentition, which is an easy and inexpensive method of positive identification via comparison with antemortem dental records. Unfortunately for law enforcement and forensic scientists, the old adage “Heads will roll!” takes a quite literal interpretation in forensic work. Recent case work in Northwest Arkansas has provided the inspiration for this pilot study. Situated in the foothills of both the Boston and the Ozark Mountains, the forested areas of Northwest Arkansas find level ground a scarce commodity. Whether it be due to carnivorous activity or the hilly terrain, the most common situation law enforcement and field recovery teams encounter include the obstacle of scattered body elements, which complicates the recovery process to the nth degree, and often results in the loss of information via incompletely collected remains. When the unre- covered elements include the skull, massive amounts of vital information have been lost. This work addresses one of the two major elements respon- sible for the scattered nature of skeletal remains in Northwest Arkansas, and many other areas of the country, the hilly terrain and its potential to disperse remains downhill. The results of a pilot study designed to ascertain the feasi- bility of continued research in the quantification of the degree of slope at which heads will begin to roll downhill in the forensic context are reported in this work. In a highly controlled laboratory setting, a single fleshed head from a cadaver donated for scientific research, with the first three cervical vertebrae attached, was experimentally rolled down a slope a total of 120 times, starting in three different positions. These three positions include facing uphill, facing downhill, and with the face towards the ground. It was physically impossible to place the skull in an anatomically correct position on the back of the skull, facing skyward, because the weight of the mandible pulled the rest of the head down and over onto the caudal surface of the attached vertebrae. This position was eliminated from the study early on in the process. Preliminary data suggests that the starting position of the head relative to the hillside influences the degree of slope required to break grav- itational inertia and begin the downhill roll. In fleshed head experiments, the nose presented a hurdle that must be overcome for the head to roll downhill. First round research shows that heads facing uphill will roll on hills with lower slopes than heads positioned facing downhill. Further testing on the skeletonized crania is required and planned to identify the pattern unique to skeletonized remains. Additionally, this study uses GIS technology to examine the potential applicability and feasibility of this research in the design of field recovery plans. It is hypothesized that watershed analysis will allow the researcher to easily predict the areas of greatest likelihood of deposition of scattered remains based on the terrain and conditions of each specific recovery site quickly and easily using readily available United States Geological Services terrain maps.

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