

Chapter 1

Forensic Anthropology: Current Tools, Future Concepts

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ABSTRACT

Traditionally, methodology within forensic anthropology has involved very basic techniques of measurement, observation and interpretation. Rooted in the academic fields of anatomy and physical anthropology, forensic anthropology has grown to address problems of recovery, determination of species, estimation of age at death, sex, ancestry, stature, postmortem interval, and the evaluation of evidence relating to foul play and identification. Growth and expansion of the field into new areas of application have revealed new problems needing new methodological solutions. Striving to resolve these problems, anthropologists have turned to new technology, or approaches utilized in related academic areas that would be new to anthropology. This chapter explores aspects of those technological developments and how they have found a home in the practice of forensic anthropology.

GROUND PENETRATING RADAR (GPR)

In some recovery situations involving suspected buried human remains, GPR has emerged as a useful approach (Conyers, 2004; Conyers & Goodman, 1997; Vaughan, 1986). Basically, this technology employs an electromagnetic pulse

directed into the ground. Measurement reveals information about the density of subsurface features and more important, details about variation in density. The technique is most effective in locating buried remains and the pit originally dug for the burial of those remains. The effectiveness of this approach rests on the principle that once a pit is dug to bury remains and the soil is placed back

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within it, the compactness of the replacement soil will differ from that of the soil in surrounding undisturbed areas. Use of GPR may detect this variation in soil compaction and thus reveal the location of the burial.

The effectiveness and utility of GPR depends upon the local environmental context and circumstances of burial (Holland & Connell, 2009; Ubelaker, 1999). The approach is most effective in homogeneous soils with minimal evidence of disturbance other than the burial itself. Use of GPR involves systematic survey of the targeted area, usually employing a grid system. Survey results then are carefully examined to detect variants of the apparent normal pattern. These variants then can be tested using traditional archeological approaches to discover the likely source of the variation. Of course, any prior soil disturbance (e.g. animal activity, pipeline excavation, construction activity) will likely be detected and need to be distinguished from a possible burial. The technique is of limited use in an area with a history of abundant soil disturbance.

MAGNETOMETRY

Clues regarding the location of clandestine graves can potentially be gathered using techniques of magnetometry. Effective use of a magnetometer may detect variations in the magnetic orientation of subsurface features (Bevan, 1983; Clark, 1996). The metal detector is a commonly employed device, effective at detecting metal materials buried in soil environments. The extreme differences in magnetic properties between buried metal and the surrounding soil facilitate detection using these instruments.

More sophisticated approaches to magnetometry allow variations in soil patterns of electromagnetic properties to be differentiated. Basically, these approaches will detect not only metal

inclusions, but also subsurface variations in the magnetic properties of soil particles. Disturbance of the soil due to grave digging will change the magnetic properties of the disturbed particles. The magnetometer will detect the difference between the disturbed soil and the surrounding undisturbed area. This approach is most useful to detect a clandestine grave within a homogeneous soil environment with minimal disturbance and minimal metal inclusions (Holland & Connell, 2009; Ubelaker, 1999).

Use of magnetometer survey is similar to that described above with GPR. Usually, the survey is conducted within a grid system. The electromagnetic data are then plotted to reveal normal patterns and to detect significant variation. As with GPR, the success of magnetometer survey is very dependent on the local environmental conditions as well as the nature of the burial. Ideal use would involve detection of a recent burial laden with metal artifacts in an environment with no metal inclusions and no history of other soil disturbance. In contrast, if the soil environment tested has a history of abundant soil disturbance with considerable metal at various locations, the burial would be more difficult to detect.

SOIL RESISTIVITY

Another approach to detecting clandestine burials utilizes the technology of the resistivity meter. This device will measure the flow of electricity through the soil and potentially detect variations leading to the discovery of the grave excavation (Bevan, 1996; Clark, 1996). Key to this approach is a thoughtful survey strategy that will quantify normal values of the area and allow variant measurement to be detected (Holland & Connell, 2009). As with GPR and magnetometry approaches, soil resistivity survey works best in areas with minimal soil disturbance.

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