H3 Detecting Various Burial Scenarios in a Controlled Setting Using Ground- Penetrating Radar

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The goal of this presentation is to demonstrate the effectiveness of grave detection using ground-penetrating radar (GPR) at a controlled research site that incorporates multiple burial scenarios. Ground-penetrating radar can be a useful geophysical instrument used by forensic investigation teams in the search for buried bodies. After attending this presentation, attendees will gain a better understanding of the capabilities of ground-penetrating radar (GPR) to detect a variety of common grave scenarios that involve buried bodies.

This presentation will impact the forensic science community by providing guidelines to death investigation personnel on the benefits of the use of GPR when searching for buried bodies.

The field of forensic archaeology has proven vital for the improvement of forensic searches by conducting controlled research with various geophysical technologies. In particular, controlled research has determined that GPR is the best geophysical tool used to locate clandestine burials of homicide victims. One advantage of using GPR is that it provides the best resolution out of all geophysical instruments because real-time data is displayed on a monitor for immediate assessment in the field. The objective of this research project is to investigate the capability of GPR to detect a variety of grave scenarios utilizing buried pig carcasses. This presentation focuses on one aspect of a larger research project involving monitoring controlled graves for a two-and-a-half year period, and will focus solely on the first six months of data collection using a 500-MHz antenna.

The ground-penetrating radar unit chosen for this research was the [Mala RAMAC X3M] with a 500-MHz antenna. GPR grid data were processed using REFLEXW and GPR-SLICE computer programs, and were displayed using radargrams (the GPR transects collected over the two rows of graves), Z-slices (planview representations of the grid that can be displayed at different depths), and fence diagrams (data viewed simultaneously in multiple planes). A permanent grid measuring 11 m by 22 m containing six graves, each with a single pig carcass, and two control graves was set up in two rows. Data were collected in both a west to east direction and a north to south direction utilizing a transect interval spacing of 0.25 m. The six graves containing pig carcasses and the two control graves were devised to test a number of common forensic scenarios involving buried bodies. The eight scenarios consisted of a deep (1.0 m) blank control grave containing only disturbed backfill to determine the geophysical response of only the disturbed soil; a shallow (0.50 m) blank control grave consisting of only disturbed backfill to determine the geophysical response of only the disturbed soil; a deep grave containing only a pig carcass; a shallow grave containing only a pig carcass; a deep pig carcass wrapped in a vinyl tarpaulin; a deep pig carcass wrapped in a cotton blanket; a deep pig carcass with a layer of lime placed over the carcass; and a deep pig carcass with a layer of rocks placed over the carcass.

Initial results using the radargrams for months one to six showed that the graves containing items over the pig carcasses (rocks or lime) displayed the best resolution out of the six scenarios with pig carcasses. The grave containing a pig carcass wrapped in a tarpaulin displayed a greater resolution compared to the grave that contained a carcass wrapped in a cotton blanket as well as both graves that contained carcasses with nothing added to the graves. When viewing the shallow Z-slices, the disturbed backfill of all of the test graves is detected. Furthermore, the Z-slices demonstrated that each of the deep graves were easily discernable compared to the shallow graves. Finally, the fence diagrams showed that each of the deep graves containing a pig carcass were easily discernable, with the graves containing rocks and lime displaying the best resolution. Overall, the combination of radargrams, Z-slices and fence diagrams provided maximum resolution and delineation of the various grave scenarios.

Forensic Archaeology, Ground-Penetrating Radar, Controlled Graves