GEOPHYSICIST SPOKE AT OCTOBER 2000 MEETING

Dr. Lee Slater, an applied geophysicist in the UMKC Geosciences Department, brought a magnetometer and a ground penetrating radar (GPR) instrument and talked about how these two types of instruments can be used to help archaeologists locate artifactual concentrations.

Slater admitted "radar cowboys" had used GPR inappropriately for a number of years, and thus a great deal of skepticism about noninvasive techniques had developed within the archaeological community. After the passage of a number of years, many archaeologists are taking serious looks at the possibilities available through the legitimate uses of applied geophysics. These noninvasive techniques can help archaeologists to decide where to dig.

Slater uses these techniques primarily to locate contaminants, but he also has applied them in archaeological endeavors. Archaeology is a side interest for him. When Slater pursued postdoctoral research in Maine, he applied geophysics to some archaeological sites.

Whether looking for contaminants or archaeological concentrations, the geophysicist can use measurements to gather data quickly to know where they most likely will find materials of concern--rather than doing many random test digs.

A GPR unit, costing around $40,000, when used appropriately measures functions of the earth which may relate to artifacts. However, GPR does not always work due to ground conditions. Electromagnetic waves do not go through clay very well, so GPR is not useful for determining concentrations in clayey soil. When conditions are compatible, GPR can help locate walls, earthen structures as ditches, stone structures in burial chambers and bones.

Some successful archaeological uses of GPR were described. When looking for an historic building in Arizona, the use of GPR located the floor and hearth, even though nothing was present on the surface. In Japan, a dispute about a large mound, possibly a burial mound, was resolved. With access to numerous GPR-generated horizontal profiles, archaeologists knew where to dig and find the burial itself and thus confirmed the mound as burial in nature. Through the use of GPR-generated vertical profiles, researchers mapped a tomb under a church in Italy. GPR successfully can locate burial chambers because the GPR can find pockets of air.

A magnetometer, costing around $11,000, has a transmitter and a receiver. Different materials have different densities, so electromagnetic waves go through various materials at different rates. When there is a contrast in densities, energy is reflected back. Archaeological features can show enhanced magnetic susceptibility. When humans have altered the nature of soils, the magnetic susceptibility may be changed. If the alterations are measured, these may help locate archaeological features. The magnetometer may be helpful if the soil has been altered by fires, as the fires of hearths, or by the fermentation of organic debris, as in garbage dumps. In addition to locating hearths, a magnetometer may help locate kilns. Sometimes this method also can be used to help locate foundations and floors, but GPR often is better for finding such structural data.

Some successful archaeological uses of the magnetometor follow. At a Native American village site, magnetometric readings showed a pattern of circles with a dot in each circle. Each circle represented a house site, and each dot represented a hearth. With this data, the entire village was mapped quickly and then the house to dig as a sample was selected. In a project Lee mapped on Clare Island in Ireland, he found many more U-shaped earthen structures than had been known from previous archaeological work. During the Bronze Age, inhabitants had heated stones and then placed them in U-shaped basins in which they poured water. Lee located around 4,000 of these U-shaped structures.

The use of both GPR and a magnetometer can be used to investigate sites when the conditions are not conducive to standard archaeological investigations. Due to frozen

ground in Maine, archaeologists can dig only six months of the year. Plus the heavy densities of trees, like is common in Maine, can be obstacles to archaeologists. However, snow, frozen ground and trees are not impediments to the geophysicist.

At a Paleo site that had been dug years earlier and again recently, test pits revealed many artifacts, but no signs of a hearth or a habitation site. A survey with a magnetometer rectified this situation. The noninvasive survey found a large burned area, which turned out to include a hearth. This survey also located a geological feature, so archaeologists did not need to waste any time digging the natural phenomenon.

Investigators at the Ft. Hill site in Gorham, Maine repeatedly have been unable to collect accurate data about the size of the fort. When some surface evidence still could be seen in 1903, people thought the fort had been 50 feet long. Later archaeological tests excavations revealed lots of artifacts, but the size and shape of the fort could not be determined. Further, a purported meeting house could not be found. In 1975, excavators still did not know exactly where the fort had been. A recent geophysical survey has begun to unravel the mystery. The fort site is much larger than suspected, and the meeting house has been located. Some excavations already have proved the geophysical findings are accurate.

Slater stressed geophysical readings easily can be misinterpreted, but he said the potential is great for those who know how to interpret the readings. Slater thinks some of the geophysical instruments will be developed specifically for archaeology in the near future. The machines already have become more sophisticated, so maps automatically are generated. Before that development, geophysicists had to draw maps using the generated readings. Geophysicists also are combining GPS with GPR and the magnetometer. The hand-held GPS systems can pinpoint spots within seven to eight meters, but the expensive GPS systems can locate to within centimeters.

GPR and the magnetometer seem destined to become standard archaeological tools. These techniques can look under such permanent structures as parking lots.

As a footnote: Slater and his students applied the geophysical techniques at the Vaile Mansion. Months ago Patrick Steele, the historic preservation officer of Independence, Missouri, and Jim Feagins met with Lee Slater to determine which areas of the Vaile estate would be high priority for geophysical surveys. They had agreed they hoped a survey would be able to cover the area southwest of the house, some areas to the north of the house including around the fountain, some areas west of the house and some areas by the lake. On Tuesday April 3rd Jim Feagins gave a slide program to Slater's class to orientate the students to the need for the noninvasive surveys. Within days the students completed the surveys.

By the way: Lee Slater goes down in KCAS history as the presenter of the first PowerPoint show at a KCAS meeting.

PATRICK STEELE TALKED AT NOVEMBER 2000 MEETING

Patrick Steele, the historic preservation officer of Independence, Missouri talked about the history of preservation in Independence. The city is required to review plans for the altering of historic buildings, whether remodeling, restoration or demolition is sought. Sometimes demolition is approved when a structure is beyond repair, as when a fire destroyed most of a home. Sometimes demolition is not approved when rehabilitation is quite possible. In other cases, the building itself may not be saved, but the reviewers may recommend salvage--that some elements be saved. In instances where a road must be widened or commercial development is deemed advisable, the reviewers may recommend the relocation of a historic structure. The oldest house