

The Application of Remote Sensing Techniques in Archaeology

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It is well known that archaeologists “dig” to acquire the information they seek about the past. And indeed, digging is an effective way for recovering artifacts produced by ancient cultures that can provide important information about the people who composed those cultures. However, digging is destructive. As an archaeological site is dug up it is systematically destroyed. This is why archaeologists take such painstaking measures to carefully document the entire process of excavation. Fortunately, archaeologists now have the benefit of modern technologies that provide non-destructive ways for obtaining information from archaeological sites. These technologies are generally referred to as “Remote Sensing.”

Remote Sensing refers to a wide variety of high-tech methods for collecting data pertaining to the physical or chemical properties of an archaeological site. Generally, these methods are split into two categories. One category includes the methods that employ aerial collection of data. This refers to methods by which data is collected from sensors installed on airplanes, helicopters, or satellites. As the sensors are flown over the ground surface they record the way in which electromagnetic radiation interacts with targets on the ground. In the case of archaeology, the target of interest is the archaeological site. There are several regions of the electromagnetic spectrum that are useful for Remote Sensing. These include the visible, ultraviolet, infrared, and microwave portions of the spectrum. Because these sensors can inform us on the composition of the earth’s surface they can often reveal traces of past human activities. For example, minute temperature variations exist among different types of soils that can often be detected by thermal infrared sensors. This type of data can sometimes be used to detect prehistoric agricultural fields because of the loose soil associated with these fields or the location of buried stone architecture because of the way the overlying soils hold water differently than areas where the absence of stone allows the water to drain deeper.

The second category of Remote Sensing techniques includes all near-ground surface technologies, as opposed to the use of aerial or elevated sensors. There are a wide variety of these techniques that are used in archaeology. Some of the more common techniques, however, include magnetic susceptibility, electrical resistivity, electromagnetic conductivity, and ground-penetrating radar. These techniques are employed through the use of hand-held instruments that measure the magnetic or electrical properties of the soil at an archaeological site. The data are collected by systematically walking numerous lines across an archaeological site while carrying one of the instruments, such as the magnetic gradiometer shown in Figure 1. As the instrument operator walks across the ground surface the instrument is measuring the properties of the soil beneath the instrument and simultaneously recording this data in either an internal or external data collector. After a site has been surveyed the information from the data collector is

downloaded into a computer where a computer program can be used to create visualizations of the data. The images produced by this process will show the locations of magnetic or electrical anomalies detected by the instrument. These anomalies often correspond to features of interest to the archaeologist, such as the locations of prehistoric houses, which often exhibit different magnetic or electric properties from the surrounding soils.

Remote Sensing techniques have proven to be very useful for archaeologists by providing a means for collecting unique information that can inform the archaeologist on the locations and types of archaeological features present at a site. These techniques are especially valuable to archaeology because they enable the collection of information in a non-destructive manner which enables archaeologists to take a more conservationist-oriented approach to the study of our non-renewable cultural resources.



Figure 1. A magnetic gradiometer being used by a student from Mississippi State University at the Lyon's Bluff archaeological site in Oktibbeha county, Mississippi