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## Hopewell Archeology: Volume , Number 1, July 1998

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## **Hopewell Archeology:**

**The Newsletter of Hopewell Archeology in the Ohio River Valley**

**Volume , Number 1, July 1998**

### **1. Weymouth Awarded Fryxell Medal by SAA**

Dr. John Weymouth, Professor Emeritus of Physics, University of Nebraska, Lincoln, was recognized by the Society for American Archeology (SAA) at its 63rd Annual Meeting in Seattle on March 27, 1998. Weymouth was presented the Fryxell Award for Interdisciplinary Research, which was initiated in 1977 to recognize excellence by a distinguished scientist whose research has contributed significantly to American archeology.

Each year the award is based on performance in one of five disciplines: earth sciences, physical sciences, general interdisciplinary studies, zoological sciences, and botanical sciences. The award, which consists of a citation and a medal, was named in memory of Roald Fryxell, whose career exemplified so well the crucial role of interdisciplinary cooperation in archeology.

To further recognize the contributions of Dr. Weymouth, many of his colleagues presented a symposium in his honor on Saturday, March 28, 1998, as part of the SAA Annual Meeting. The paper I presented at the symposium is printed in this issue of Hopewell Archeology to offer some documentation of Dr. Weymouth's important contributions to midwestern archeology.

### **2. Geophysical Surveys in the Mid-Continent: John Weymouth and the Midwest Archeological Center By Mark J. Lynott**

A paper presented at the 63rd Annual Meeting of the Society for American Archeology, Seattle, Washington, March 28, 1998.

When I got started in archeology, the skills of archeologists were judged largely by their ability to move dirt and dig a nice square hole. Archeology was highly excavation oriented. As a graduate student in the mid-1970s, I received my first exposure to geophysical survey techniques being developed in Great Britain. I was fascinated with the idea of seeing subsurface features without actual excavation, and the newly developing conservation archeology provided further inspiration for interest in non-destructive research. Unfortunately, the early application of geophysical survey methods were very limited in North America, and I soon gave up hope of having access to a magnetometer or soil resistance meter.

Imagine my surprise in 1978 when I moved to Lincoln, Nebraska, to join the Midwest Archeological Center and discovered that John Weymouth was using magnetometers to map village sites in the Middle Missouri drainage. My delight in discovering a physicist located in the

city where I lived, and with an interest in archeology, has subsequently multiplied as I have come to know, respect, and admire the man as much as his work.

I count myself as truly fortunate to have had the opportunity to work and interact with John Weymouth on a regular basis for the last fifteen years. Not only has he taught me the value and importance of geophysical survey methods for archeology, but his energy, interest, and professionalism have served as inspirations for all of us at the Midwest Archeological Center who have had the good fortune to work with him.

During the last twenty years, John Weymouth has worked on geophysical survey projects in National Park Service areas throughout the United States. Although the bulk of his National Park Service work has been done in association with the Midwest Archeological Center in the Midwest Region, his expertise has led to his participation in projects from Ninety Six in South Carolina, to Chaco Canyon and Tumacocori in New Mexico, to Fort Clatsop in Oregon, and Knife River Indian Villages and Fort Union Trading Post in North Dakota.

He has worked on projects relating to at least eighteen parks, on sites that range from Hopewell, Anasazi or Plains Village to frontier forts, fur trade posts, and presidential homes. Time does not permit me to review all of his accomplishments and work with the Midwest Archeological Center. But, I would like to take this opportunity to highlight his contributions in three midwestern areas.

#### Plains Village Sites

John's work with the Midwest Archeological Center began at the Walth Bay site (Weymouth 1976) on the edge of Oahe Reservoir, south of Mobridge, South Dakota. His work at the Walth Bay site demonstrated that in flat areas with relatively uniform soil conditions which have not been cultivated, it was possible to locate fire basins, cache pits, and house floors up to 0.5 meters below surface. This initial study demonstrated the potential value of magnetic survey for planning excavations at Plains Village sites.

John continued his work in refining the applicability of magnetic survey in this region at Knife River Indian Villages near Stanton, North Dakota (Weymouth 1986, 1988; Weymouth and Nickel 1977). At sites like Sakakawea, Lower Hidatsa, and Big Hidatsa, he was able to identify an earthlodge anomaly pattern. This pattern included a central hearth feature that was recognized as monopole anomaly with typical values of 30 to 40 nT. This anomaly was surrounded by a magnetically lower region associated with the house floor.

Many of the earthlodges that we examined exhibited evidence of entryways that also appeared as magnetically low regions. The houses were usually surrounded by magnetic highs produced by slumped roof soils and midden deposits. This work demonstrated that magnetic survey could be used to examine the internal composition of house depressions visible on the surface, and magnetometers could also be used to identify subsurface house features that are not visible on the surface. John demonstrated that magnetic survey could be used effectively in cultivated areas, although he recommended that data collection intervals be reduced under these circumstances.

John's work at Knife River Indian Villages reflects methodological themes that he has subsequently applied to research at other sites throughout North America. Of particular importance, he demonstrated that it is possible to mathematically filter data to neutralize the effect of large, modern magnetic disturbances adjacent to prehistoric archeological sites (Weymouth 1986) when he identified prehistoric hearths near a modern courthouse at the Amahami site. He also deduced that under local conditions, pits must be at least 0.1 cubic meter to produce anomalies of at least 1 nT, which led him to suggest that more sensitive magnetometers were needed to detect smaller features.

## Eastern Ozarks

The Midwest Archeological Center initiated a long-term study of human adaptations in the Eastern Ozarks in 1981. At that time, little was known about the archeology of that region, and chronology building was a prime consideration of our research. As part of that study, we hoped to use geophysical survey to assist us in identifying subsurface features that would provide materials suitable for dating. John Weymouth assisted us by conducting proton magnetometer surveys and data analysis at both Emergent Mississippian and Mississippian sites in this region (Weymouth 1982), most of which showed considerable promise.

Real progress in our use of geophysical survey techniques during limited archeological testing was realized at the Shawnee Creek site (Lynott and Price 1989). Initial testing at this site revealed the presence of a burned, rectangular wall trench house, characteristic of the later Mississippian stage, but dating to the Emergent Mississippian, twelfth century A.D. Our goal was to identify other houses or features that might provide datable materials and diagnostic material culture relating to the Emergent Mississippian occupation.

We surveyed three 20-m by 20-m blocks adjacent to the burned house. Dr. Weymouth requested two surveys at this site. One was conducted with the magnetometer sensor 60 cm above surface, and the second survey was conducted with the sensor 30 cm above surface. This was done with two Geometric G856 Memory Magnetometers. The two surveys with different instrument heights effectively simulated a gradiometer survey, and they eliminated some broad geological trends present at the site.

In his analysis of the Shawnee Creek data, John identified fourteen anomalies of possible archeological significance (Weymouth 1988). The Center returned to the site a year later and tested five of the identified anomalies. Four of these proved to be features associated with the Emergent Mississippian occupation. No feature was identified at the location of the fifth anomaly, but this may be due to its location on the edge of the survey grid.

It is possible that the feature does indeed exist just outside the magnetic survey grid. Our excavation unit should have been extended to the east. However, the overall results of the magnetic survey were extremely satisfying. We were able to economically and effectively locate subsurface features at the Shawnee Creek site and greatly reduce the amount of time spent in the field trying to locate suitable features.

## Ohio Hopewell

John Weymouth's introduction to Ohio Hopewell came in the late 1970s, when a crew from the Midwest Archeological Center collected magnetometer survey data from three 20-m by 20-m blocks at Seip and from a single block at Harness. John analyzed the data and identified anomalies that might be of archeological significance. More recently, John has been working closely with the Center and Dr. N'omi Greber on a variety of geophysical survey projects associated with Hopewell mounds and earthworks in southern Ohio.

In 1994, the National Park Service initiated a five-year study of Hopewell culture in Ross County, Ohio. Ohio Hopewell is best known from the large, geometric earthwork complexes in the Scioto River valley in southern Ohio. Within this region, Ross County contains many impressive earthwork sites, and it is the location of Hopewell Culture National Historical Park. Although many Hopewell sites were carefully documented as early as the middle of the nineteenth century (Squier and Davis 1848), annual cultivation has severely impacted many of these sites.

Consequently, the multi-year study initiated by the National Park Service was designed to document the existing conditions at these sites and to develop techniques that could be used to record and interpret mounds and earthworks without further damage to these features. Geophysical surveys were proposed to relocate earthworks and mounds that are no longer visible today, and to study the extent and structure of mounds visible today.

Our five-year study was also aimed at identifying possible settlements or habitation sites associated with the larger earthwork sites in Ross County. Although the earthworks and mounds have received considerable archeological attention, they did not appear to be used for day-to-day settlement, and very little was known about habitation sites associated with Hopewell culture. Therefore, we intended to identify, study, and interpret habitation sites and features (**Figure 1**) associated with the use and construction of earthwork complexes.



**Figure 1.** Pit filled with fire-cracked rock, charcoal, and lithic debris at the Hopeton Earthworks, excavated in 1994.

Geophysical surveys were an integral part of the project design, and John Weymouth was extremely helpful in developing a plan to incorporate geophysical surveys into this project. The first large-scale attempt at geophysical survey associated with this five-year study was undertaken at the Hopeton Earthworks, where two parallel walls have been obliterated by cultivation. In 1994, we established a grid near the edge of the terrace upon which the earthwork is constructed. John Weymouth directed field data collection for eight 20-m by 20-m blocks with a resistance system and three blocks with magnetometers (**Figure 2**). About that time, John also worked with our colleague N'omi Greber on using both of these techniques at the High Banks site.



**Figure 2. Forest Frost conducting a resistivity survey at Hopeton Earthworks, 1994.**

These surveys were somewhat successful in relocating one wall of the two parallel walls. Although no conclusive evidence was detected from the magnetometer data, the resistance data did indicate a linear area of low resistance angling about 55 degrees east of north across the study area (Weymouth 1995). This is consistent with the location and bearing of these features as mapped by Squier and Davis (1848). Although the area of survey coverage was not large enough to have identified both of the parallel walls, it would appear that the feature, roughly 9 to 12 meters wide, is the remains of one of the walls.

John provided additional support and direction for geophysical study of mounds and earthworks in 1996, when he and Bruce Bevan and N'omi Greber joined us for multi-instrument studies of two mound sites at Wright-Patterson Air Force Base near Dayton, Ohio. The study was funded by the U.S. Air Force and the National Park Service and was intended to determine whether geophysical survey methods could be used to investigate the structure, content, and condition of mounds and earthworks (Lynott 1997). John Weymouth's role in this study was to advise on the

design, scheduling, and implementation of the study, and to direct the collection of gradiometer and soil resistance data.

The Wright-Patterson study is important because it represents one of the few studies where geophysicists and archeologists have collaborated to deal with the problems associated with topographic variability in the study of mounds and earthworks. The importance of developing non-destructive methods of studying mounds and earthworks has been recognized by archeologists for many years, and that need has been reinforced by the passage of the Native American Graves Protection and Repatriation Act.

Identification of habitation features from geophysical surveys has been a significant theme in John Weymouth's research with the National Park Service for more than 20 years. Unfortunately, the nature of these features in Ross County Hopewell sites is poorly understood. Consequently, John's work to identify features at the Overly site has been quite important. The Overly site geophysical surveys were accomplished with two GEM GSM-19 Overhauser magnetometers and a Geoscan RM-15 resistance meter with twin probe configuration. The survey areas were identified by surface remains recorded during pedestrian surveys by Ohio State University.

Results of the geophysical survey of the Overly site were reported after an Ohio State University field school (Dancey 1997) stripped the plowzone from a 15 by 40 meter area and excavated 22 cultural features. John's analysis of this data (Weymouth 1996) focused on the size (as indicated by volume and quantity of fire-cracked rock) of features that were positively identified as geophysical anomalies.

Of particular importance from this study was John's recognition that smaller features did not produce sufficient magnetic signal to be recognized by surveys conducted at one-meter intervals. Consequently, John recommended that future surveys in this area be conducted at smaller intervals, thereby allowing identification of smaller archeological features. This led to our current project, which required a return to the area of the parallel walls at the Hopeton Earthworks that we investigated in 1994.



**Figure 3. Geophysical survey team at the Hopeton Earthworks. Left to right, front row: N'omi Greber, John Weymouth, and Steve De Vore; back row: Debra Wood, Bret Ruby, Phil Wanyerka, and Forest Frost. Not shown: Mark Lynott.**

In September 1997, John Weymouth, Steve DeVore, Bret Ruby, and N'omi Greber joined a Midwest Archeological Center field team (**Figure 3**) in collecting gradiometer and soil resistance data from twenty-seven 20-m by 20-m blocks along the edge of the terrace at the Hopeton Earthworks. Although the results of this survey are not yet available, it is worth noting that this represents one of the largest geophysical survey data sets collected from the eastern United States.

The study also incorporated John's concern for smaller data collection intervals, with a commensurate increase in data points, thereby making recognition of smaller features more likely.

The study also demonstrates the importance of using multiple instruments. While the RM-15 resistance system did produce some evidence of a large feature that appears to represent remnants of one of the parallel earthen walls, the two gradiometers used at the site did not produce evidence of these larger features. On the other hand, the gradiometers did appear to be more productive in collecting evidence of possible habitation features than was the resistance meter. It is our intent to return to this area in July 1998 to conduct excavations and to evaluate the data and interpretations resulting from continued geophysical surveys.

## Conclusions

Those of us in the National Park Service who have had the good fortune to have worked with John Weymouth have learned a great deal about geophysical survey and its application to archeological research. We recognize the advances that John has made in refining methods and interpretations, thereby allowing us to derive more and better interpretations from geophysical data. However, it is likely that the real impact of John's work is yet to be fully understood. As geophysical survey techniques become an ever increasing component of archeology's research



arsenal, it is likely that we will develop an even greater appreciation for what John Weymouth has done for archeology. His pioneering efforts have brought geophysical survey to the attention of the North American archeological community.

The staff of the Midwest Archeological Center is honored to have had the opportunity to work with John Weymouth over the last twenty years, and we look forward to another twenty years of participating in his productive and interesting geophysical study of archeological sites.

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