
FIFTH SCIENCE AND ARCHAEOLOGY SYMPOSIUM IN URBANA



UNIVERSITY OF ILLINOIS AT URBANA—CHAMPAIGN
I-HOTEL AND CONFERENCE CENTER
LINCOLN ROOM

PROGRAM AND ABSTRACTS

HOSTED BY

ANCIENT TECHNOLOGIES AND ARCHAEOLOGICAL MATERIALS (ATAM)

DR. KRISTIN HEDMAN, *ASSISTANT DIRECTOR*

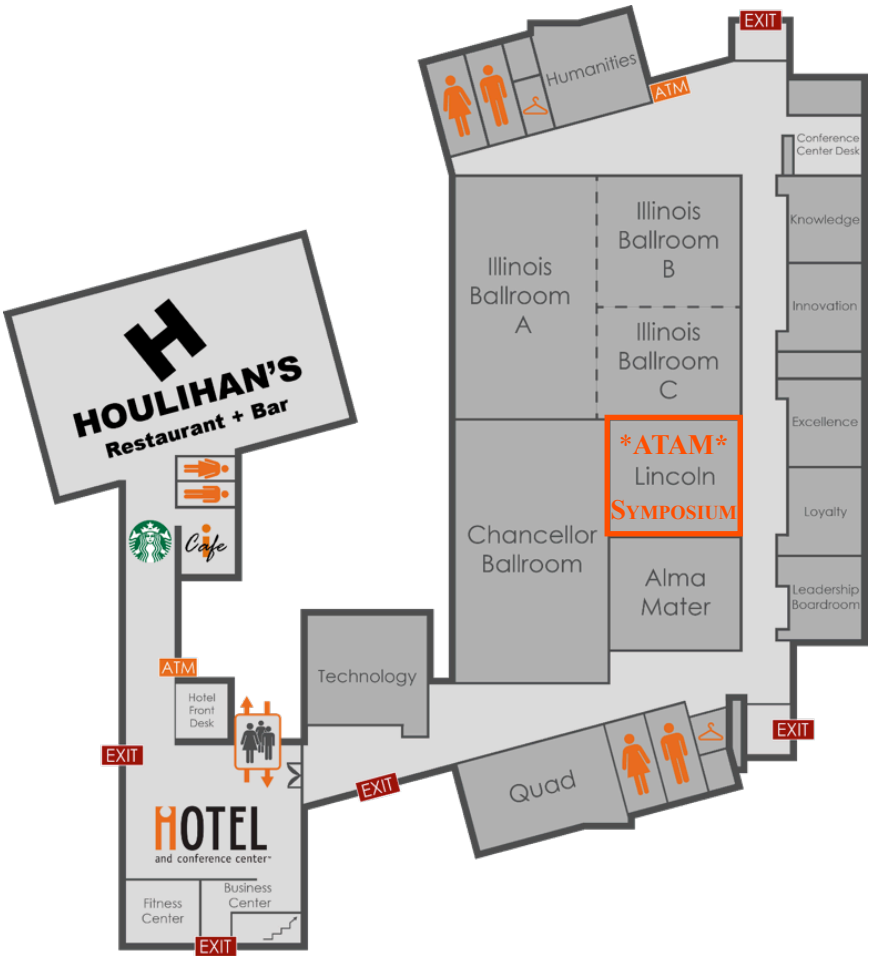
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Illinois State Archaeological Survey
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FEBRUARY 23, 2018

I-HOTEL AND CONFERENCE CENTER



FIFTH SCIENCE AND ARCHAEOLOGY SYMPOSIUM IN URBANA



PROGRAM AND ABSTRACTS

Archaeological science, or archaeometry, is the interface between archaeology and the natural and physical sciences. This interdisciplinary field encompasses both the study of early technologies (flint knapping, ceramics, textiles, etc.) and analyses of archaeological and historic materials using modern instrumental techniques. Research and applications include isotope and chemical analysis of environment, diet and migration, compositional and sourcing studies, ancient DNA evidence of population history, remote sensing and satellite imaging, 3D imaging and digital enhancement technologies—among others.

FIFTH SCIENCE AND ARCHAEOLOGY SYMPOSIUM IN URBANA

FEBRUARY 23, 2018

8:30 Registration and poster set-up

9:00 Kristin M. Hedman — *Welcome and Introduction*

9:15 Karthik Yarlagadda (2017 ATAM Mini-grant Recipient), Kelsey E. Witt, Kelly S. Swanson, and Ripan S. Malhi — *Comparison of Ancient and Modern Dog Fecal Microbiomes*

9:30 Richard W. Edwards and Robert Jeske — *The Canine Surrogacy Approach and Human Dietary Choices in the Prairie Peninsula*

9:45 Stanley H. Ambrose, Zachry W. Benmamoun, Andrew M. Zipkin, and Jessica L. Thompson — *Reconstructing Later Stone Age Paleoenvironments in Northern Malawi with Ostrich Eggshell Stable Isotope Ratios*

10:00 Madeleine G. Evans — *Strontium Isotope Ratios as a Diagnostic Trait of Midwestern Chert*

10:15 Andrew M. Zipkin, Alex Taylor, Alyssa Dwyer, Gideon Bartov, Stanley H. Ambrose, and Craig C. Lundstrom — *Red Rock and Black Glass: Geochemical Methods and Provenance Case Studies of Ochres from the Kenya Rift Valley*

10:30-10:50

BREAK

10:50 Zachary W. Benmamoun, Andrew M. Zipkin, Gideon Bartov, and Stanley H. Ambrose — *What is the Best Method to Measure Bioavailable Strontium Isotope Ratios for Archaeological Provenance?*

10:55 Matthew A. Fort, Kristin M. Hedman, and Stanley H. Ambrose — *The Radiocarbon Reservoir Effect in the American Bottom*

11:00 Yahui Qiu, Hong Ao, Yunxiang Zhang, Peixian Shu, Yongxiang Li, Xingwen Li, and Peng Zhang — *Magnetostratigraphic Dating of the Linyi Fauna: Implications for Early Pleistocene Mammalian Biochronology on the Chinese Loess Plateau*

11:05 Peixian Shu, Stanley H. Ambrose, and Hong Wang — *Intra- and Inter-tooth Variation in Oxygen and Carbon Isotope Ratios of Fossil Mammal Teeth from Salawusu (Inner Mongolia, north China): Implications for Late Pleistocene Paleoenvironments*

11:10-11:30 *Discussion*

Presenters: *Please gather by the registration table for a group photo.*

11:30- 1:00

LUNCH (on your own)

- 1:00** Jayur Madhusudan Metha — *Coupled Ecosystems Resilience and Native American Monumental Architecture along the Mississippi River Delta*
- 1:15** Brad H. Koldehoff, Randall E. Hughes, Robert N. Collins, and Thomas J. Loebel — *Danville Porcellanite: Documenting an Ancient Coal-Burn in the Illinois Basin*
- 1:30** Robert G. McCullough — *Using Electromagnetic Induction Techniques as a Complement to Magnetometry Survey*
- 1:45** Ryan M. Parish, Cem Akkus, and Brad H. Koldehoff — *Surveying the Crescent Quarry Complex with LiDAR*
- 2:00** *Robert G. McCullough, Tom Crapnell, Rachel Lawrence, Thomas J. Loebel, Sarah Scattergood, Spencer Skadden, B. Jacob Skousen, and Daniel Smith — *Geophysical Survey at the Multiethnic Noble-Wieting Site (11ML24) in the East Central Illinois Prairie*
- 2:05** Jean T. Larmon, Susan M. Alt, and Timothy R. Pauketat — *A Micromorphological Perspective into the Emerald Acropolis*
- 2:10** B. Jacob Skousen and Robert G. McCullough — *Magnetometry Survey at the Otter Pond Site (11LW9), a Vincennes Phase Town in Southeastern Illinois*

2:15-2:30

BREAK

- 2:30** Kathy Walsh, Jade Zhiyu Wang, and Julio Soares — *Not Just Pretty Pictures (But Plenty of Those, Too): Imaging and Compositional Analysis at the Materials Research Laboratory*
- 2:45** Alleen Betzenhauser, Sarah Harken, Victoria Potter, Madeleine G. Evans, Kjersti Emerson, and Adam Tufano — *Investigating Stumpware: Evidence for Pre-Mississippian Nixtamalization in Illinois*
- 2:50** Isabelle Ortt, Brandon Battas, Charles Lasky, Jessica Scharrer, Jonathan Micon, and H. Kory Cooper — *Experimental Replication of Native Copper Projectile Points*
- 2:55** Michael L. Hargrave, Carey Baxter, George Calfas, Matt Richards, and Andy Hamblin — *LiDAR, UAVs and 3-D Scanning in Cultural Property Protection*
- 3:00** *John M. Lambert and Michael G. Farkas — *3D Scanning of Archaeological Collections: Applications for Curation, Analysis, and Outreach*
- 3:05** *Thomas J. Loebel, Dean Frigo, Kristin M. Hedman, John M. Lambert, and Wayne Pitard — *Imaging Enigmatic Textile Impressed Clay Objects from Kane County, Illinois*
- 3:10** *Mary R. Hynes — *What's Old is New Again: Three-Dimensional Stereographic Images Make a Comeback*

3:15-3:30 Discussion

3:30-4:30 Posters, Demonstrations, Conversation

*Posters with demonstrations

FIFTH SCIENCE AND ARCHAEOLOGY SYMPOSIUM IN URBANA

ABSTRACTS

Stanley H. Ambrose (ambrose@illinois.edu—Department of Anthropology, University of Illinois), **Zachry W. Benmamoun** (Chemical and Biomolecular Engineering, University of Illinois), **Andrew M. Zipkin** (Department of Anthropology, University of Illinois), and **Jessica L. Thompson** (Department of Anthropology, Emory University)

RECONSTRUCTING LATER STONE AGE PALEOENVIRONMENTS IN NORTHERN MALAWI WITH OSTRICH EGGSHELL STABLE ISOTOPE RATIOS

Environments of Later Stone Age (LSA) foragers in northern Malawi can be reconstructed by isotopic analysis of ostrich eggshell (OES). Ostrich prefer open savanna environments, and are historically absent from the Zambezian savanna woodland ecozone. OES fragments and beads throughout LSA deposits in Hora and Mazinga rockshelters suggest paleoenvironmental differences. Carbon and oxygen isotope ratios of OES from levels dating <5 to ~14 ka are clearly bimodal within strata in both sites. Five fragments with high $\delta^{13}\text{C}$ (-6‰ to -10‰) and $\delta^{18}\text{O}$ (38-41‰) resemble those from open, hot, semi-desert environments such as Turkana, Kenya (annual temperature 29°C; rainfall 186mm; elevation 500m). Seven with low $\delta^{18}\text{O}$ (30-34‰) resemble values from Ntuka, Kenya highlands (18.6°; 750mm; 1700m). However, very low $\delta^{13}\text{C}$ (-10‰ to -12‰) indicates unusually low C4 grass abundance. Direct dates on each specimen are needed to determine whether bimodality within strata reflects stratigraphic displacement, diachronic differences or semi-synchronic environmental variation. [*Presentation*]

Natalie Becerra+Stasiewicz (nbecerra@illinois.edu, Materials Research Laboratory, University of Illinois)

----CANCELLED----

MATERIALS CHARACTERIZATION VIA X-RAY FLUORESCENCE

The Materials Research Lab has an X-Ray Fluorescence instrument, by Shimadzu, that can measure both sample thickness and composition of almost any form of sample (solid, liquid, or powder). X-ray Fluorescence is a materials characterization technique that uses the fluorescence of X-rays to non-destructively determine the elemental composition of samples. MRL's Energy Dispersive XRF instrument (called Shimadzu EDXRF) can measure any element with an atomic number of 11 or greater. Natalie Becerra+Stasiewicz will discuss some interesting measurements that can be made with this quick, easy-to-use, instrument and is happy to discuss collaborations across departments.

Zachary Benmamoun (benmamo2@illinois.edu—Chemical and Biomolecular Engineering, University of Illinois), **Andrew Zipkin** (Department of Anthropology, University of Illinois), **Gideon Bartov** (Department of Geology, University of Illinois), and **Stanley H. Ambrose** (Department of Anthropology, University of Illinois)

WHAT IS THE BEST METHOD TO MEASURE BIOAVAILABLE STRONTIUM ISOTOPE RATIOS FOR ARCHAEOLOGICAL PROVENANCE?

The strontium isotope ratio of archaeological biomaterials is a useful chemical “fingerprint” for determining provenance. Strontium is mainly derived from bedrock weathering. However, it also enters the foodweb as airborne dust, rainwater, and flowing water, and is removed by chemical weathering. Moreover, the bioavailable strontium isotope ratio of soil may differ from that of total soil or bedrock. We measured $87\text{Sr}/86\text{Sr}$ for total soil strontium, strontium extracted by soil leaching procedures of varying intensity, and strontium in plants. Paired soil and plant samples from 10 locations in Malawi were analyzed for an archaeological provenance study of Later Stone Age sites. Plants exhibited more consistent strontium yields than any soil leaching procedure, and had significantly less barium and rubidium, which interfere with strontium isotope measurement. The $87\text{Sr}/86\text{Sr}$ ratio of plants best reflects bioavailable strontium and presents fewer instrumental obstacles than soils, simplifying construction of an isoscape for archaeological provenance research. [Poster]

Alleen Betzenhauser (betzenha@illinois.edu—Illinois State Archaeological Survey), **Sarah Harken** (Illinois State Archaeological Survey), **Victoria Potter** (Illinois State Archaeological Survey), **Madeleine G. Evans** (Illinois State Archaeological Survey), **Kjersti Emerson** (Illinois State Archaeological Survey), and **Adam Tufano** (Illinois State Archaeological Survey)

INVESTIGATING STUMPWARE: EVIDENCE FOR PRE-MISSISSIPPIAN NIXTAMALIZATION IN ILLINOIS

Stumpware is a ceramic utensil that appears abruptly at the beginning of the Terminal Late Woodland period (ca. AD 900) in the American Bottom region of Illinois. Several functions have been postulated but the timing of its introduction (coincident with the beginning of maize horticulture in the region) and the prevalence of white residue are suggestive of their role in the production of quicklime for use in the nixtamalization of maize. We present the initial results of our efforts to test this hypothesis by creating and using replica stumpware. We then examine the replicas and archaeological examples using x-ray fluorescence to determine the elemental composition of the residue deposits. Preliminary results support the hypothesis that stumpware was used to process limestone for use in nixtamalization. [Poster]

Richard W. Edwards (wedwards@uwm.edu—Department of Anthropology, University of Wisconsin-Milwaukee) and **Robert Jeske** (Department of Anthropology, University of Wisconsin-Milwaukee)

THE CANINE SURROGACY APPROACH AND HUMAN DIETARY CHOICES IN THE PRAIRIE PENINSULA

The Canine Surrogacy Approach (CSA) is a method that uses stable isotopic values from dog bones as proxies for their human companions' values. CSA relies on the premise that the special symbiotic relationship between dogs and humans results in both species

eating similar foods. This inference has been supported with archaeological evidence from prehistoric sites across the globe. A prime benefit of CSA is that isotopic data can be collected on diet and mobility in places where human remains are unavailable for destructive analysis. In the North American Prairie Peninsula, CSA has great potential to elucidate aspects of diachronic and synchronic culture change associated with shifting subsistence patterns. In this paper, we demonstrate the evidence for the efficacy of CSA, and discuss the results of a small-scale study of diet choices in several archaeologically defined cultures in the Prairie Peninsula. [*Presentation*]

Madeleine G. Evans (mgarceau@illinois.edu—Illinois State Archaeological Survey)

STRONTIUM ISOTOPE RATIOS AS A DIAGNOSTIC TRAIT OF MIDWESTERN CHERT

Raw material procurement patterns, particularly those centered on the acquisition of chert and other siliceous material for the production of chipped stone tools, has provided a wealth of information on how prehistoric populations interacted with each other and with the landscape. Visual assessment by an analyst familiar with local resources is generally a sufficient means of addressing these activities. In cases involving the long-distance exchange or transport of raw material, however, more objective and precise methods of source assignment may be necessary. This paper describes an ongoing study using strontium isotope ratios to distinguish between visually similar chert from two source areas in southern Indiana and southern Illinois. [*Presentation*]

Matthew A. Fort (fort1@illinois.edu—Illinois State Archaeological Survey), **Kristin M. Hedman** (Illinois State Archaeological Survey), and **Stanley H. Ambrose** (Department of Anthropology, University of Illinois)

THE RADIOCARBON RESERVOIR EFFECT IN THE AMERICAN BOTTOM

The Radiocarbon Reservoir Effect (RRE) involves the uptake of older carbon into aquatic and terrestrial foodwebs. Its magnitude varies greatly among rivers and lakes. It can increase radiocarbon ages on consumers of aquatic foods by decades to centuries. Archaeological RRE studies in Northern Eurasia have focused on bone collagen and pottery food residues, and on pottery in North America. Measuring the RRE in the American Bottom is essential because aquatic foods were important in human diets, and accurate and precise dates on human bones are needed to reconstruct complex sequences of cultural processes such as Mississippianization. Our preliminary study of the RRE in the American Bottom shows offsets between paired terrestrial herbivore and fish bones from two sites with dates of 0 to 700 BP. Correcting RREs for human and dog collagen radiocarbon dates may be possible using collagen and tooth enamel stable isotopes and enamel radiocarbon dates of collagen dated individuals. [*Poster*]

Michael L. Hargrave (michael.l.hargrave@erdc.usace.army.mil—ERDC Construction Engineering Research Lab), **Carey Baxter** (ERDC Construction Engineering Research Lab), **George Calfas** (ERDC Construction Engineering Research Lab), **Matt Richards** (ERDC Construction Engineering Research Lab), and **Andy Hamblin** (ERDC Construction Engineering Research Lab)

LiDAR, UAVs AND 3-D SCANNING IN CULTURAL PROPERTY PROTECTION

Archaeologists engaged in cultural resources management (CRM) on military

installations have increasing opportunities to incorporate unmanned aerial vehicles (UAVs), LiDAR, ground-based 3-D scanning, near-surface geophysics, and other remote sensing methods into their CRM work. Those techniques are being integrated into CRM work under controlled conditions where adequate time and technical expertise is available. Some archaeologists who focus on military CRM are also developing approaches to assist US forces and partner nations in protecting cultural properties outside the continental US that are threatened by looting, natural disasters, and armed conflict. Cultural Property Protection (CPP) approaches need to be cost-effective and scalable to challenging circumstances that may include serious shortages in time and trained personnel, and the need to work in harsh and even potentially dangerous conditions. Methods such as 3-D scanning, UAVs, and LiDAR will play important roles in CPP because they can collect useful, reliable data very quickly. *[Poster]*

Mary R. Hynes (mhynes@illinois.edu—Illinois State Archaeological Survey)

WHAT'S OLD IS NEW AGAIN: THREE- DIMENSIONAL STEREOSCOPIC IMAGES MAKE A COMEBACK

Stereo cameras producing stereo slides were popular during the late 1940s to early 1970s, capturing events so others could view them as the photographer saw them, in three-dimensions using a stereoviewer. In 2016, ISAS received a donation that included three boxes of stereo mounted slides documenting a burial feature at Cahokia Mound 72. Using a 1950's stereo viewer, ISAS physical anthropologists had the opportunity to "experience" the commingled, superpositioned burials; but by digitizing the slides they are now available for easier viewing--on a computer monitor, iPad, mobile phone, or paper using inexpensive lenses. There are phone apps that allow photos to be captured and aligned to be viewed in 3D. With Photoshop and a little work, any image can be made to appear three-dimensionally. Simple techniques may provide the means of adding visual clarity to field narratives of complex stratigraphic material. *[Poster/Demonstration]*

Brad H. Koldehoff (Brad.Koldehoff@illinois.gov—Illinois Department of Transportation), **Randall E. Hughes** (Illinois State Geological Society, Retired), **Robert N. Collins** (East Central Illinois Archaeological Society), and **Thomas J. Loebel** (Illinois State Archaeological Survey)

DANVILLE PORCELLANITE: DOCUMENTING AN ANCIENT COAL-BURN IN THE ILLINOIS BASIN

This paper documents an unusual lithic resource in the Illinois Basin, Danville Porcellanite. Underlying much of Illinois and adjacent parts of Indiana and Kentucky, the Illinois Basin is a depressed bedrock structure with uppermost layers composed of chert-poor Pennsylvanian units dominated by coal, shale, and sandstone. Danville Porcellanite is a pyrometamorphic rock type, a nature-made ceramic material (baked shale) with a good conchoidal fracture, and it resembles similar pyrometamorphic materials from the Northern Plains. In East-Central Illinois, it was periodically fashioned into projectile points, starting in the Early Archaic. Investigations in the Danville area, primarily by citizen scientists, have identified ancient workshops and recent cut-bank exposures. These discoveries demonstrate that this unusual chipped-stone resource is locally derived and represents a previously undocumented ancient coal-burn. *[Presentation]*

John M. Lambert (lambertj@illinois.edu—Illinois State Archaeological Survey) and **Michael G. Farkas** (Illinois State Archaeological Survey)

3D SCANNING OF ARCHAEOLOGICAL COLLECTIONS: APPLICATIONS FOR CURATION, ANALYSIS, AND OUTREACH

3D scanning technologies have numerous potential applications to the analysis of shape data at a range of spatial scales, and represent one relatively cost-effective way to collect high resolution, three-dimensional morphometric data. Here we present the results of a preliminary study on how this technology can be incorporated into analysis, curation, and public outreach involving archaeological collections. Data were collected using several models of scanners (both laser and structured light), and were processed using a suite of open-source and proprietary software packages. We present a workflow from raw point cloud to finished, textured 3D mesh. Evaluation of 3D models produced using laser vs. structured light scanners indicates that both classes perform admirably for most material types (e.g., ceramics, dry bone), but differ significantly in their ability to capture accurate morphometric data for small objects with complex geometry (e.g., sharp-edged stone tools) or reflective surfaces (e.g., shell, glossy cherts). [*Poster/Demonstration*]

Jean T. Larmon (larmon2@illinois.edu—Department of Anthropology, University of Illinois), **Susan M. Alt** (Department of Anthropology, Indiana University), and **Timothy R. Pauketat** (Illinois State Archaeological Survey)

A MICROMORPHOLOGICAL PERSPECTIVE INTO THE EMERALD ACROPOLIS

A Pleistocene moraine was significantly modified into a religious “acropolis” by Cahokians, circa AD 1050 ± 25. Construction fills have been identified on the slopes of this ridge and religious buildings were added and periodically dismantled in conjunction with earthmoving and surface-plastering events. Two dozen sediment blocks from the Emerald Acropolis (11S1) have been subjected to micromorphological analysis, with the results highlighting that these events were short term and associated with very little surface weathering. The yellow plastered floors of the buildings, on the other hand, were exposed to water prior to final burial. Both contexts indicate intermittent if highly orchestrated human activity. [*Poster*]

Thomas J. Loebel (tjl2@illinois.edu—Illinois State Archaeological Survey), **Dean Frigo**, **Kristin M. Hedman** (Illinois State Archaeological Survey), **John M. Lambert** (Illinois State Archaeological Survey), and **Wayne Pitard** (Spurlock Museum, University of Illinois, Retired)

IMAGING ENIGMATIC TEXTILE IMPRESSED CLAY OBJECTS FROM KANE COUNTY, ILLINOIS

Various imaging techniques were employed to enhance and record subtle surface impressions present on three enigmatic clay objects recovered from a construction site in Kane County, Illinois. Polynomial texture mapping, also known as Reflectance Transformation Imaging (RTI), is a technique of imaging and interactively displaying objects under varying lighting conditions to reveal surface phenomena. 3D laser scanning was also used to record information on the geometry and surface texture of the clay objects. This combined approach serves to record, archive, and aid in the analysis of these unique items, which are interpreted to represent the remains of woven textile bags used to gather and store potting clay for prehistoric ceramic manufacture, probably sometime during the Woodland Period (3000-1250 BP). [*Poster/Demonstration*]

Robert G. McCullough (mccullor@illinois.edu—Illinois State Archaeological Survey)

USING ELECTROMAGNETIC INDUCTION TECHNIQUES AS A COMPLEMENT TO MAGNETOMETRY SURVEY

Although geophysical survey techniques are becoming increasingly routine in archaeological investigations, magnetic susceptibility surveys have been underutilized in the United States and Britain. However, with the development of improved electromagnetic induction (EMI) instrumentation, the collection of magnetic susceptibility data for wide-area archaeological surveys is becoming more practical. Magnetic susceptibility, when combined with other geophysical techniques, can provide a more complete evaluation of subsurface anomalies at archaeological sites. This paper compares the results of both magnetometry and magnetic susceptibility surveys on a 19th-century cemetery and a Late Prehistoric village in Illinois, demonstrating the utility of the newer dual-coil EMI instruments in close-interval spatial surveys. A Bartington Grad 601-1 gradiometer and a Geonics EM38-MK2 EMI were employed for this study, and the pros and cons of each technique will also be presented. [*Presentation*]

Robert G. McCullough (mccullor@illinois.edu—Illinois State Archaeological Survey), **Tom Crappnell** (Illinois State Archaeological Survey), **Rachel Lawrence** (Illinois State Archaeological Survey), **Thomas J. Loebel** (Illinois State Archaeological Survey), **Sarah Scattergood** (Illinois State Archaeological Survey), **Spencer Skadden** (Illinois State Archaeological Survey), **B. Jacob Skousen** (Illinois State Archaeological Survey), and **Daniel Smith** (Illinois State Archaeological Survey)

GEOPHYSICAL SURVEY AT THE MULTIETHNIC NOBLE-WIETING SITE (11ML24) IN THE EAST CENTRAL ILLINOIS PRAIRIE

The Illinois State Archaeological Survey conducted a geophysical survey at the Noble-Wieting site in McLean County, Illinois. The site is located on a rise near the confluence of the Kickapoo and Little Kickapoo creeks in an ecotone where the bottoms once supported large oak groves surrounded by the central Illinois prairie. The village site extends approximately 5.8 acres and previously had a mound within its boundaries. Previous investigations have produced both Langford and Mississippian ceramics and a few radiocarbon dates that place this site within the 13th to 14th centuries. A magnetometer survey indicated an oval pattern of structures around a central plaza, a possible stockade wall, and clusters of large storage pits in some areas of the site. This pattern is presumably more Langford than Mississippian. A magnetic susceptibility survey was also conducted in selected areas that augmented the magnetometer survey, identifying additional structures and the potential mound location. [*Poster/Demonstration*]

Jayur Madhusudan Mehta (jayur@illinois.edu—Department of Anthropology, University of Illinois) and **Elizabeth Chamberlain** (Department of Earth and Environmental Sciences, Vanderbilt University)

COUPLED ECOSYSTEMS RESILIENCE AND NATIVE AMERICAN MONUMENTAL ARCHITECTURE ALONG THE MISSISSIPPI RIVER DELTA

Ethnohistoric, archaeological, and geological data from the Mississippi River Delta (MRD) are used to describe coupled ecosystems resilience (CER), a paradigm

encompassing the dialectic between human populations and the environments in which they live and how human societies create landmarks that enhance memory, sustainability, and the long-term meaningfulness of landscapes. We describe earthen monument construction relative to the formation of the MRD and demonstrate that the locations of Native American towns and the monuments themselves were subject to long-term reuse by indigenous societies and colonial settlers. Consequently, we suggest human-made, monumental landscapes coupled with oral traditions and natural topography enhanced CER within a dynamic ecosystem that was frequently changed by storm events, sea-level fluctuation, shifting stream systems, and more recently, human-induced climatic shifts. In this constantly evolving deltaic environment, CER served to embed persistence into monumental, anthropogenic landscapes. *[Presentation]*

Isabelle Ortt (iortt@purdue.edu—Department of Anthropology, Purdue University), **Brandon Battas** (School of Materials Engineering, Purdue University), **Charles Lasky** (School of Materials Engineering, Purdue University), **Jessica Scharrer** (School of Materials Engineering, Purdue University), **Jonathan Micon** (Departments of Anthropology and History, Purdue University; Department of Anthropology, University of Georgia), and **H. Kory Cooper** (Department of Anthropology and School of Materials Engineering, Purdue University)

EXPERIMENTAL REPLICATION OF NATIVE COPPER PROJECTILE POINTS

Previous studies of native copper artifacts have successfully used metallography and replicative experiments to provide a basic understanding of fabrication techniques in different contexts in North America. However, many questions still remain regarding how certain tools were made. Workman (1976) suggested one possible method for manufacturing copper projectile points based on his work at the Gulkana site, but this idea had not previously been tested. This poster presents the results of experimental attempts to replicate native copper projectile points such as those found at Late Prehistoric Dene archaeological sites in Alaska and Yukon. *[Poster]*

Ryan M. Parish (rmparish@memphis.edu—Department of Earth Sciences, University of Memphis, Tennessee), **Cem Akkus** (Benjamin L. Hooks Institute, University of Memphis, Tennessee), and **Brad H. Koldehoff** (Illinois Department of Transportation)

SURVEYING THE CRESCENT QUARRY COMPLEX WITH LiDAR

Burlington chert from the Crescent Quarries was extensively used throughout prehistory in the American Bottom region and adjacent areas. Yet little work has been undertaken to document its local extraction and processing, particularly the spatial extent of quarry pits and associated workshops. In this paper, we present the preliminary results from our analysis of LiDAR data from the main quarry area and adjacent hills. This effort is part of an ongoing research program aimed at not only documenting the spatial extent of quarrying activities but also to spectrally characterize the chert resources from the quarry complex. *[Presentation]*

Yahui Qiu (qiu_yahui@163.com—Geology, Northwest University, Xi'an), **Hong Ao** (Institute of Earth Environment, Chinese Academy of Sciences, Xi'an), **Yunxiang Zhang** (Geology, Northwest University, Xi'an), **Peixian Shu** (Department

of Anthropology, University of Illinois), **Yongxiang Li** (Geology, Northwest University, Xi'an), **Xingwen Li** (Institute of Earth Environment, Chinese Academy of Sciences, Xi'an), and **Peng Zhang** (Institute of Earth Environment, Chinese Academy of Sciences, Xi'an)

MAGNETOSTRATIGRAPHIC DATING OF THE LINYI FAUNA: IMPLICATIONS FOR EARLY PLEISTOCENE MAMMALIAN BIOCHRONOLOGY ON THE CHINESE LOESS PLATEAU

The Chinese Loess Plateau (CLP) of North China is an important archive of environmental changes and mammal and early human evolution in Asia spanning the last 2.6 million years (Ma). Establishing precise ages for CLP faunas is critical for understanding these environmental, biological, and archaeological archives. We report a new magnetostratigraphic record that places age constraints on the Linyi Fauna. The 170-m-thick Linyi section comprises a sequence of ~82 m of loess and paleosols overlying ~88 m of fluvial and lacustrine sediments. Paleomagnetic polarity measurements on 296 samples identified the normal polarity Brunhes chron, Jaramillo and Olduvai subchrons, and reverse polarity portions of the intervening Matuyama chron. The Linyi Fauna is stratified within fluvial sediments between the Jaramillo (1.1 Ma) and Olduvai (1.8 Ma) subchrons, with an estimated age of ~1.5–1.6 Ma. Combined with previously dated faunas, we establish a magnetochronology spanning 2.54 to 0.65 Ma for CLP faunas. [*Poster*]

Peixian Shu (peixian@illinois.edu, Department of Anthropology, University of Illinois; Institute of Earth Environmental, Chinese Academy of Sciences), **Stanley H. Ambrose** (Department of Anthropology, University of Illinois), and **Hong Wang** (Illinois State Geological Survey, Retired)

INTRA- AND INTER-TOOTH VARIATION IN OXYGEN AND CARBON ISOTOPE RATIOS OF FOSSIL MAMMAL TEETH FROM SALAWUSU (INNER MONGOLIA, NORTH CHINA): IMPLICATIONS FOR LATE PLEISTOCENE PALEOENVIRONMENTS

Salawusu is the type site for Upper Pleistocene faunas, late Paleolithic artifacts and *Homo sapien* fossils of the Loess Plateau of northern China. Intra-annual climatic and environmental variation was reconstructed by isotopic analysis of serial microsamples of enamel from four herbivore teeth. Last glacial (Marine Isotope Stage 3, ~30–50,000 BP) ass tooth $\delta^{18}\text{O}$ values vary from 23‰ to 30‰, indicating cold winters and cool dry summers. Low $\delta^{13}\text{C}$ values (-9.2‰ to -11‰) suggest small percentages of C4 tropical grasses during summers. Results on one elephant also indicate a cool high latitude temperate environment. One late Holocene domestic ass (~1000 bp) has much higher $\delta^{13}\text{C}$ (-8.3‰ to -5.1‰), indicating summer monsoon rainfall with C4 prairie-type grasses, and/or foddering with millets. Its lower range of $\delta^{18}\text{O}$ (24–26.8‰) suggests a lower latitude temperate environment with a warmer winter and warm humid summer. These results demonstrate significant differences between last glacial and recent environments. [*Poster*]

B. Jacob Skousen (bskousen@illinois.edu—Illinois State Archaeological Survey) and **Robert G. McCullough** (Illinois State Archaeological Survey)

MAGNETOMETRY SURVEY AT THE OTTER POND SITE (11LW9), A VINCENNES PHASE TOWN IN SOUTHEASTERN ILLINOIS

The Otter Pond site (11LW9), located in Lawrence County, Illinois, is the largest Mississippian mound site attributed to the Vincennes phase. The site exhibits up to

9 mounds, a plaza, and Mississippian and Late Woodland pottery, all indicative of a sizable, multiethnic town. This poster presents the results of a 2017 magnetometry survey of Otter Pond. The survey, which covered approximately 50% of the total site area, proved that large portions of the site are still intact. It also revealed 1) dense residential clusters, 2) a complex occupational history, 3) potential status differences among residents, and 4) mound locations and orientations. This survey provided much-needed information on the internal configuration of this settlement. It may also shed light into how the construction and use of space in large settlements Mississippianized local groups in southeastern Illinois from AD 1100 to 1400. [Poster]

Kathy Walsh (kawalsh@illinois.edu—Materials Research Laboratory, University of Illinois), **Jade Zhiyu Wang** (Materials Research Laboratory, University of Illinois), and **Julio Soares** (Materials Research Laboratory, University of Illinois)

NOT JUST PRETTY PICTURES (BUT PLENTY OF THOSE, TOO): IMAGING AND COMPOSITIONAL ANALYSIS AT THE MATERIALS RESEARCH LABORATORY

Multiple microscopic imaging and compositional analysis techniques are available in shared facilities open to all on the University of Illinois campus and other academic institutions around the globe. This review highlights a few of the archaeometrically-relevant techniques available at the Materials Research Laboratory, particularly focusing on nondestructive imaging and microscale compositional analysis. Data from multiple microscopic imaging and microscale compositional analysis techniques will be presented using geological samples as examples, and strategies for imaging samples nondestructively will be discussed. One of the most versatile techniques for high-resolution microscopic imaging is Scanning Electron Microscopy (SEM), and the SEM-EDS system is also capable of elemental compositional analysis. Optical and scanned probe techniques can provide complementary information on microscopic structure and material composition. [Presentation]

Karthik Yarlagadda* (yarlaga2@illinois.edu—Department of Anthropology, University of Illinois), **Kelsey E. Witt** (School of Natural Sciences, University of California-Merced), **Kelly S. Swanson** (Department of Animal Sciences and Division of Nutritional Sciences, University of Illinois), and **Ripan S. Malhi** (Departments of Anthropology and Animal Biology, University of Illinois)

*2017 ATAM Student Mini-grant Recipient

COMPARISON OF ANCIENT AND MODERN DOG FECAL MICROBIOMES

Coprolites, or fossilized fecal matter, can provide important insight into the past lives of animals. They contain organic remains from the organism's diet, DNA from the original organism, as well as genetic material from microorganisms. The quality of these genetic markers is dependent on preservation, but under ideal conditions, several of these markers can be used to create a larger picture of ancient health. We utilized ancient DNA lab techniques and shotgun sequencing to analyze eight dog coprolites from the Janey B. Goode archaeological site, which is located near Cahokia and includes Late Woodland and Mississippian components. Here, we attempt the reconstruction of the ancient dog fecal microbiome. We furthermore compare these ancient microbiomes to that of modern dogs on two different diets. This study provides a novel understanding of the ancient dog fecal microbiome, and demonstrates how comparative methods can be used to identify ancient dietary practices. [Presentation]

Andrew M. Zipkin (amzipkin@illinois.edu—Department of Anthropology, University of Illinois), **Alex Taylor** (Department of Geology, University of Illinois), **Alyssa Dwyer** (Department of Chemistry, University of Illinois), **Gideon Bartov** (Department of Geology, University of Illinois), **Stanley H. Ambrose** (Department of Anthropology, University of Illinois), and **Craig C. Lundstrom** (Department of Geology, University of Illinois)

RED ROCK AND BLACK GLASS: GEOCHEMICAL METHODS AND PROVENANCE CASE STUDIES OF OCHRES FROM THE KENYA RIFT VALLEY

Geochemical provenance analysis is a powerful tool for interpreting object and place biographies in the archaeological record. Ferruginous mineral pigments, or ochres, are an important artifact class for anthropological archaeology because of their consistent appearance as a signifier of symbolic practices in sites up to 300,000 years old. In this study, we united Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry with a refined ochre processing procedure using lithium borate fusion to characterize dozens of geologic ochre sources in the Kenya Rift Valley (KRV). A major finding is that ochre deposits of the Central Kenya Peralkaline Province can be distinguished from all other KRV sources using their strontium/dysprosium concentration ratios. We also present sourcing case studies of archaeological ochres, including long-distance transport of ochre to the Neolithic cremation site of Njoro River Cave and preliminary provenance results for the oldest modified ochre in East Africa, from the Middle Stone Age of Olorgesailie, Kenya. [*Presentation*]

2017-2018 ATAM Mini-grant Awardees

The ISAS Program on Ancient Technologies and Archaeological Materials (ATAM) Student Mini-grants in Archaeometry are intended to assist University of Illinois undergraduate or graduate students to conduct archaeometric studies related to MA or PhD theses or capstone projects. Funding is provided by ISAS. Students are expected to conduct analyses at University of Illinois laboratory/facilities.

Alyssa Bader—Using ancient dental calculus as a less destructive method of reconstructing paleodiet in the ancestral Coast Tsimshian community of Prince Rupert Harbour, Canada.

Alyssa will use stable isotope analysis of dental calculus as a potential less destructive tool for paleodietary studies. This will be part of her larger dissertation research that considers dietary change and social change among the Tsimshian of Prince Rupert Harbour, Canada. Stable isotope analysis will be conducted in the Environmental Isotope Paleobiogeochemistry Lab in the Department of Anthropology.

Karthik Yarlagadda—The Influence of diet on the ancient dog gut microbiome.

Karthik will use existing genomic data from archaeological dog coprolites, and comparative data from modern dogs, to better understand the dog genetic microbiome of the gut under certain diets. It will provide a previously untapped dataset for exploring diet and the interaction of dogs and humans (e.g., feeding). This research will be a chapter in his dissertation and will utilize a bioinformatics pipeline on the Institute for Genomic Biology Biocluster.

Check the ISAS/ATAM website for future offerings of ATAM Mini-grants.



SPURLOCK MUSEUM
AND THE ILLINOIS STATE ARCHAEOLOGICAL SURVEY
PRESENT

Cahokia's Religion

THE ART OF RED
GODDESSES, BLACK DRINK,
& THE UNDERWORLD

WHITTEN FEATURED OBJECTS CASE
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a conference honoring 150 years of research at the University of Illinois

The Illinois State Archaeological Survey, part of the Prairie Research Institute at the University of Illinois, cordially invites you to the Ancient Cahokia Future Visions Conference. This conference is part of the University of Illinois' 150th anniversary celebration and sponsored by the Office of the Vice Chancellor for Research.

Friday April 27, 2018 at the I-Hotel on the campus of the
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This conference is free to attend but you must register <https://cahokiainconference.wixsite.com/cc2018>

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The **ANCIENT TECHNOLOGIES AND ARCHAEOLOGICAL MATERIALS PROGRAM (ATAM)** serves as the archaeological sciences research arm of the Illinois State Archaeological Survey, Prairie Research Institute, University of Illinois at Urbana–Champaign. The mission of ATAM is to promote, encourage, and facilitate interdisciplinary research between students, professionals and others in archaeology and the natural and physical sciences, social sciences, and humanities programs within the Prairie Research Institute and the University of Illinois.

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