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.

Organization: The oral sessions will consist of fifteen-minute papers. Posters on recent research will be displayed throughout the day. Poster presenters will be at their posters during the Poster and Demonstration session.

Presenters: Please load your PowerPoint presentation on the conference laptop upon arrival.

Posters: Staff from the Illinois State Archaeological Survey will be available to assist with hanging posters.
Fouth Science and Archaeology Symposium in Urbana
February 19, 2016

8:30  Registration, poster set up, load PowerPoint presentations to conference laptop
9:00  Kristin M. Hedman — Welcome and Introduction
9:15  Jean T. Larmon* — Against the Grain: Using Pollen to Produce a Microclimate Reconstruction of Cara Blanca, Belize
9:30  Montana Martin* — Stable Isotope Analysis of Middle Woodland Ceramics from Ogden-Fettie
9:45  Adam Sutherland* — Exploring Diet in the Early Late Woodland Period: Stable Isotope Analysis of Absorbed Food Residues at the Apple Creek and Egan Sites
10:00 Mary L. Simon — Understanding Maize History in Western Illinois: A Cautionary Tale
10:15-10:30  BREAK
10:30  Laura Kozuch — Crafting Shell Beads at East St. Louis and Greater Cahokia
11:00 Madeleine Evans, Brenda Beck, and Tom Loebel — Use-wear Analysis of an Early Holocene Tool Cache from the Vasey Site, Madison County, Illinois
11:15 Jean T. Larmon, Stanley H. Ambrose, Bruce W. Fouke, Hong Wang, H. Gregory McDonald, and Lisa J. Lucero — Taking a Bite Out of History: Isotopic and Cathodoluminescence Analysis of an Extinct Giant Ground Sloth Tooth
11:30  Presenters — Please gather by the registration table for a group photo
11:30-1:00  LUNCH (list of local eateries at the registration table)
1:00  Kathy Walsh and Natalie Becerra-Stasiewicz — Archaeologically-Relevant Techniques at the Materials Research Laboratory
1:15  Robert G. McCullough — The Applicability of Magnetic Susceptibility in Wide-Area Archaeological Surveys
1:30  George Calfas — LiDAR Mounted Drone Systems: HiRes Data that You Collect Yourself
1:45  Brent Lansdell, Edward R. Henry, and Steven L. Boles — Organizing Cahokian Life North of Downtown: Geophysical Exploration of the Microlith and Shell Bead Industries at the Kunnemann Tract
2:00-2:15  BREAK
2:15 Alison Carter and Laure Dussubieux — *Using LA-ICP-MS to Study Agate and Carnelian Bead Exchange in South and Southeast Asia*

2:30 Andrew Zipkin, Stanley Ambrose, John Hanchar, Philip Piccoli, Alison Brooks, and Elizabeth Anthony — *Elemental Fingerprinting of Kenya Rift Valley Ochre Deposits for Provenance Studies of Rock Art and Archaeological Pigments*

2:45 John W. Scott, Kristin M. Hedman, Richard L. Fishel, and Trudi E. Butler — *Chemical Analyses of the Ingredients of an 1850s Thomson’s Compound Syrup of Tar Patent Medicine Bottle*

3:00 Jessica L. Harrison and Frederika A. Kaestle — *Low Recovery Rate of Mitochondrial aDNA from Cahokia, Mound 72*

3:15 Thomas E. Emerson — *Closing Remarks*

3:30- 4:30 POSTERS AND DEMONSTRATIONS

**POSTERS**

Carey L. Baxter — *CATS and (HHRD) Dogs at ERDC-CERL*

Michael G. Farkas — *Examining Monks Mound through Aerial LiDAR*

Michael L. Hargrave, R. Berle Clay, Diana Greenlee, and Rinita Dalan — *LiDAR Investigations of the Mound E Ridge at Poverty Point*

Kristin M. Hedman, Philip A. Slater, Matthew A. Fort, and Thomas E. Emerson — *Establishing a Strontium Isoscape for the American Midcontinent: Who were Cahokia’s Immigrants?*

Amanda Owings* — *Prince Rupert Harbour mtDNA Genetic Analysis*

Adam Tufano, Lenna Nash, Steven Boles, and Amanda Butler — *What’s On This Earspool? Point and Shoot Elemental Detection using PXRF*

Kelsey E. Witt* and Ripan S. Malhi — *Genetic Comparison of Ancient Dog Populations in the Americas*

Ling Xue, You Yue, Ma Jian, Wang Jianxin — *Isotopic Analysis of Domestic Mammals from Dongheigou, Xinjiang Autonomous Region, Northwest China*

**DEMONSTRATIONS**

Geonics EM38-MK2 and Magnetometer (Robert McCullough, ISAS)

Microhardness Tester (Kathy Walsh, MRL)

PIMA (Mary Hynes, ISAS)

PXRF (Madeleine Evans, ISAS)
**Geonics EM38-MK2 and Magnetometer**
A gradiometer is used to detect fluctuations in the earth’s natural magnetic field caused by the presence of cultural materials such as nutrient rich soil, fired clay, heated rock, or iron artifacts. An electromagnetic induction (EMI) instrument simultaneously measures conductivity and magnetic susceptibility. Unlike a magnetometer survey, the EMI instrument isolates the induced magnetism component and collects it differently from the gradiometer. Together, these two instruments can provide information about human activities on the landscape.

**Microhardness Tester**
The Vickers hardness test, or microhardness test, uses a diamond indenter to make an indentation on the surface of a material. The indentation is measured and converted into a hardness value. This particular piece of equipment can measure hardness up to approximately 5 Newtons, and is suitable for surfaces like smooth rocks.

**PIMA**
The Portable Infrared Mineral Analyzer (PIMA) uses the shortwave infrared (SWIR) portion (1300-2500 nm) of the electromagnetic spectrum to measure reflected radiation from a sample surface. The signature of the radiation absorbed by the specimen reveal the inter-atomic bond energies that characterize specific minerals and display them as PIMA spectra. The PIMA has been used by ISAS in projects for identifying and sourcing pipestone and catlinite artifacts.

**pXRF**
The pXRF is a portable, instrument that uses X-ray Fluorescence technology for non-destructive elemental analysis making it highly useful for application to certain archaeological materials. When an X-ray beam penetrates the surface of a sample, it induces radiation with energy levels that are specific to the elements present. The energy is then dispersed along a spectrum with peaks representing the intensity or abundance of specific elements. The pXRF is a portable, instrument that uses X-ray Fluorescence technology for non-destructive elemental analysis making it highly useful for application to certain archaeological materials. When an X-ray beam penetrates the surface of a sample, it induces radiation with energy levels that are specific to the elements present. The energy is then dispersed along a spectrum with peaks representing the intensity or abundance of specific elements.
Stanley H. Ambrose (ambrose@illinois.edu–UIUC, Anthropology), Fiona Marshall (Washington University, St. Louis, Anthropology), Andrew Wreschnig (Washington University, St. Louis, Earth and Planetary Sciences), and Steven Goldstein (Washington University, St. Louis, Anthropology)

**Neolithic Pastoral Settlements Create Enduring Soil Nutrient Hotspots in East African Savannas**

Pastoralists are usually considered to have negative impacts on African savanna ecosystems through overgrazing and soil erosion. However, ecologists show that corrals in abandoned herder settlements have high nitrogen and phosphate levels, and productive vegetation and grazing successions. Little is known about how long these effects persist or how widespread they may be. We sampled sediments in five Pastoral Neolithic archaeological sites (1900-2500 bp), and nearby natural soil profiles in two regions of Kenya for carbon and nitrogen isotope analysis. Archaeological sediment profiles include layers of ash from burned dung, and burned subsoil. Isotopic analyses show elevated nitrogen content, indicating long term nutrient enrichment, and high nitrogen isotope ratios. Four sites have distinctive vegetation patterns that are identifiable in satellite images. These nutrient hotspots have positive effects on savanna ecosystems, generating a mosaic of vegetation communities that have increased productivity, biodiversity and resilience for at least 2500 years.

Carey L. Baxter (Carey.L.Baxter@usace.army.mil–US Army-Engineer Research and Development Center, Construction Engineering Research Laboratory)

**CATS and (HHRD) Dogs at ERDC-CERL**

A recent development in noninvasive grave location techniques is the use of Historic Human Remains Detection (HHRD) dogs. These dogs are specially trained to detect the scent of buried human bones. Proponents of this technique claim the dogs can differentiate between human and animal bones and can detect graves exceeding 100 years of age and located up to 6 feet beneath the surface. Determining the effectiveness of HHRD dog surveys is problematic because ground truthing is rarely allowed. Trials were conducted at the Controlled Archaeological Test Site (CATS) at ERDC-CERL, Champaign IL and at unmarked historic cemeteries at Fort Gordon, GA in 2013 to test the results of HHRD dog surveys against the results of traditional geophysical surveys. This poster summarizes the results of those trials.
LiDAR Mounted Drone Systems: HiRes Data That You Collect Yourself

LiDAR, or Light Detection and Ranging, is a remote sensing method that uses pulsed laser light to measure distances to the Earth. The LiDAR instrument fires rapid pulses of laser light at a surface, some at up to 150,000 pulses per second. Light moves at a constant and known speed, so the LiDAR sensors can easily calculate the distance between itself and the target with high accuracy. By repeating this in quick succession, the instrument builds up a complex ‘map’ of the surface it is measuring. When mounted to lightweight Unmanned Aerial Vehicles (UAV) or “drones” LiDAR systems, and accompanied software, can produce Digital Elevation Maps (DEM) so that archaeologists can identify, map, survey, and monitor archaeological sites.

Using LA-ICP-MS to Study Agate and Carnelian Bead Exchange in South and Southeast Asia

Agate and carnelian beads are some of the earliest indicators of contact between South and Southeast Asia in Iron Age period (500 BCE - 500 CE) Southeast Asia. Scholars initially assumed the beads were imported from India, although recently several researchers have proposed that there may have also been local production in Southeast Asia. This paper describes a recent study using laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) to characterize agate and carnelian artifacts from Cambodia and Thailand and geologic sources from South and Southeast Asia. Preliminary results indicate that most of the beads were made from a geologic source located in the Deccan Traps in India.

Use-wear Analysis of an Early Holocene Tool Cache from the Vasey Site, Madison County, Illinois

ISAS investigations for the FAP-310 project exposed a buried Early Holocene living surface at the Vasey site in the uplands north of the American Bottom. We suggest, based on the vertical distribution of temporally diagnostic tools and on raw material compatibility, that the features and material remains associated with this surface result largely from a single Dalton or Theban component. Distinct activity areas suggest use of the site as a winter hunting camp. This paper focuses on the results of high power microscopic use-wear analysis performed on a tool cache composed primarily of robust end scrapers.
Michael G. Farkas (mgfarkas@illinois.edu–Illinois State Archaeological Survey)

EXAMINING MONKS MOUND THROUGH AERIAL LiDAR

Monks Mound, located within the prehistoric city of Cahokia, is North America’s largest earthen pyramid. Over the years, there have been many attempts to map the mound. Using the techniques of each era, topographic maps were produced from methods such as traditional land surveying and photogrammetry. The increasing availability of aerial LiDAR has allowed for some of the most accurate measures of the mound ever undertaken. Based on LiDAR data collected between January 2011 and September 2013, this poster provides a new view of the mound and presents a method to quantify areas of both change and stability within the mound’s surface morphology. The data are derived from a preliminary joint study of the mound by the Illinois State Archaeological Survey, the Illinois State Geological Survey and the Illinois Historic Preservation Agency.

Michael L. Hargrave (Michael.L.Hargrave@usace.army.mil–US Army-Engineer Research and Development Center, Construction Engineering Research Laboratory), R. Berle Clay (Cultural Resource Analysts, Inc., Retired), Diana Greenlee (Poverty Point Station Archaeology Program, University of Louisiana at Monroe), and Rinita Dalan (Minnesota State University-Moorhead)

LiDAR Investigations of the Mound E Ridge at Poverty Point

LiDAR provides a valuable capability to contextualize the results of recent large area geophysical investigations as well as earlier excavations at Poverty Point. The ability to visualize the site landscape from any angle and to exaggerate the vertical component has revealed a number of previously unrecognized or under investigated spatial relationships among topographic and archaeological features. One example is the Mound E Ridge. LiDAR suggests that, rather than being simply a short spur, the Mound E Ridge may have run along the Southwest Aisle, connecting Mound E with the Plaza. Associated with the Mound E Ridge is a subtle topographic high located near where the West Aisle opens onto the Plaza. Our discovery in the magnetic data of numerous post circles in this area and along the plaza’s southern margins lends new relevance to the post concentrations that Haag excavated there in the 1970s.

Jessica L. Harrison (harrijes@indiana.edu–Indiana University-Bloomington) and Frederika A. Kaestle (Indiana University-Bloomington)

Low Recovery Rate of Mitochondrial aDNA from Cahokia, Mound 72

Mound 72 is a small ridge top mound located in the southern-central outer edge of the mound structures at Cahokia. The mound contained many elaborate burial assemblages, with more than 260 individuals that date to approximately 1000 AD, and coincides with the advent of the Mississippian culture. Using non-destructive extraction procedures, teeth from 62 individuals from 8 burial features of varying levels of status were submitted to ancient DNA testing. Informative HVS1 sequence was obtained from 19 individuals, a success rate of 30.6 percent. Our analysis shows
no evidence of significant differences in haplogroup or haplotype frequencies between Mound 72 and other contemporaneous sites that have been characterized in the region or between mortuary assemblages within the site. Currently NGS analysis is underway to overcome the low success rate of PCR analysis and poor quality of many of the sequences previously obtained.

Kristin M. Hedman (khedman@illinois.edu–Illinois State Archaeological Survey), Philip A. Slater (Illinois State Archaeological Survey), Matthew A. Fort (Illinois State Archaeological Survey), and Thomas E. Emerson (Illinois State Archaeological Survey)

Establishing a Strontium Isoscape for the American Midcontinent: Who Were Cahokia’s Immigrants?

Strontium isotope values (87Sr/86Sr) are used to study prehistoric human population movement worldwide. Archaeological research in the Midwest has highlighted the importance of population movement in promoting cultural and sociopolitical change. For example, our earlier strontium (87Sr/86Sr) isotope research identified one-third of Cahokia’s inhabitants as immigrants. Locating the homelands of these immigrants has remained problematic due to the lack of regional strontium data. This poster presents new 87Sr/86Sr data derived from fauna from Minnesota to Mississippi that creates the first regional strontium ‘isoscape’ map to guide the identification of potential places of origin for Cahokia’s immigrants.

Laura Kozuch (lkozuch@illinois.edu–Illinois State Archaeological Survey)

Crafting Shell Beads at East St. Louis and Greater Cahokia

Lightning whelk shells from the Gulf of Mexico were used to make shell beads found at Greater Cahokia and other Mississippian sites. Disk bead crafting was different than columella bead crafting, since the shell materials are different. Trobriand Islanders also used stone tools to make disk beads and are used as an ethnographic analogy. Coastal California tribes are also used as an ethnographic comparison for making columella beads. Columella beads were made with whelk columellas with the groove-and-snap technique. I propose that stone microdrills were used to drill disk beads, and biological materials augmented with grit were used to drill columella beads.

Brent Lansdell (mblansd@illinois.edu–Illinois State Archaeological Survey), Edward R. Henry (Washington University), and Steven L. Boles (Illinois State Archaeological Survey)

Organizing Cahokian Life North of Downtown: Geophysical Exploration of the Microlith and Shell Bead Industries at the Kunnemann Tract

Recent geophysical investigations of the Kunnemann Tract have been undertaken with the goal of identifying subsurface features associated with high densities of surface collected microliths. This area has long been associated with microlith drills
and blades likely used in the production of shell ornaments, especially beads. Further investigation of these features may provide evidence of the nature and ubiquity of shell bead production at Cahokia. Related microlith industries spanning the lower Mississippi Valley and Greater Southeastern U.S. indicate that the production and consumption of shell ornaments was an important factor in the historical trajectories of Mississippian political economies.

Jean T. Larmon (larmon2@illinois.edu–UIUC, Anthropology)

*2014 ATAM Minigrant Recipient

AGAINST THE GRAIN: USING POLLEN TO PRODUCE A MICROCLIMATE RECONSTRUCTION OF CARA BLANCA, BELIZE

The Terminal Classic (800-900 C.E.) Maya in central Belize faced increasingly arid conditions that threatened their rainfall dependent society. It has been hypothesized that drought was a primary factor in the abandonment of lowland Maya cities. A problem with research regarding this hypothesis is analyses of Maya sites often employ climate reconstructions from a great distance; however, the Maya would likely have been confronting local variations in broader regional trends. I use pollen as a proxy for climate in order to produce a localized reconstruction for the Cara Blanca region. A sediment core, dating from 500 to 1730 CE, was extracted from a cenote in central Belize. It provides valuable information for the region, which is thought to include multiple ritual structures. This study identifies the most effective processing protocol for the isolation and identification of Cara Blanca Pool 6 pollen and presents the preliminary results of the palynological reconstruction.

Jean T. Larmon (larmon2@illinois.edu–UIUC, Anthropology), Stanley H. Ambrose (UIUC, Anthropology), Bruce W. Fouke (UIUC, Geology; Microbiology; Institute for Genomic Biology), Hong Wang (Illinois State Geological Survey), H. Gregory McDonald (Bureau of Land Management), and Lisa J. Lucero (UIUC, Anthropology)

TAKING A BITE OUT OF HISTORY: ISOTOPIC AND CATHODOLUMINESCENCE ANALYSIS OF AN EXTINCT GIANT GROUND SLOTH TOOTH

This study examines stable carbon and oxygen isotope ratios from an extinct giant sloth (Eremotherium laurillardi) tooth recovered from a cenote (water-filled sinkhole) in central Belize. Cathodoluminescence microscopy uses electron beam bombardment in a vacuum to stimulate visible light emission from the sample. This helps to identify the structure of the original tooth, as well as secondary post-depositional alteration (diagenesis). We found that orthodentine is most resistant to diagenesis and can be used for dating and stable isotopic analysis. The analysis of twenty microsamples extracted from the orthodentine shows moderate seasonal variation in climate, reflecting variation in water stress of the C3 plants that the sloth consumed at the end of the last Ice Age, when many megafauna disappeared. This gigantic sloth, standing six meters tall, likely descended into the cenote for a drink during a dry season and became trapped until divers recovered its remains thousands of years later.
Montana Martin (martin15@illinois.edu–UIUC, Anthropology)  
*2015 ATAM Minigrant Recipient

STABLE ISOTOPE ANALYSIS OF MIDDLE WOODLAND CERAMICS FROM OGDEN-FETTIE

This project uses the ceramic collection gathered from Ogden-Fettie, which is a Middle Woodland Mound Group located in the Central Illinois Valley, to draw conclusions about the diet of prehistoric peoples inhabiting the site. The Middle Woodland diet is mainly understood through faunal and floral analysis of archaeological collections, but by using Isotopic Analysis to look at the stable isotopes of Carbon 13 and Nitrogen 15 it is possible to ascertain what types of foods were being cooked in ceramic vessels. The analysis was done on both Havana (secular) and Hopewell (ceremonial) ceramics from Ogden-Fettie.

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

THE APPLICABILITY OF MAGNETIC SUSCEPTIBILITY IN WIDE-AREA ARCHAEOLOGICAL SURVEYS

Such geophysical survey techniques as ground-penetrating radar, soil resistivity, and magnetometry are increasingly familiar in archaeological investigations. Magnetic susceptibility surveys have been underutilized in the United States and Britain, but with the development of improved electromagnetic induction (EMI) instrumentation, the collection of magnetic susceptibility data for wide-area archaeological surveys is becoming more practical. The newer dual coil EMI instruments have corrected some of the limitations of the past devices and allow for relatively rapid data collection. The discussion will focus specifically on the Geonics EM38-MK2 that was recently purchased by Illinois State Archaeological Survey. The advantages and limitations of magnetic susceptibility surveys in the context of other near-surface geophysical instruments that are readily available to the archaeologist will be presented.

Amanda Owings (aowings2@illinois.edu–UIUC, School of Integrative Biology)  
*2014 ATAM Minigrant Recipient

PRINCE RUPERT HARBOUR mtDNA GENETIC ANALYSIS

Excavations at Prince Rupert Harbour archeological sites in British Columbia have unearthed 240 individuals belonging to populations that continually occupied the area from 500-6000 years ago. Archeological data and oral histories suggest that descendant Tsimshian tribes still live in British Columbia and have volunteered for a DNA study to establish genetic ties. Eighty modern and ancient individuals had small portions of their mtDNA (maternal DNA) sequenced and seven were sequenced for the whole mitogenome. These individuals appear to have genetic ties to the ancient Prince Rupert Harbour. Typically a small portion of mtDNA is sufficient to place it into a group indicating ancestry, however one individual that was sequenced for a small portion of mtDNA could not be placed into a DNA group (haplogroup). We sequenced the mitogenome for this individual so that we could assign it to a haplogroup, and see if it was found in any living individuals.
John W. Scott (zhewang@illinois.edu–Illinois Sustainable Technology Center), Kristin M. Hedman (Ancient Technology And Archaeological Materials/Illinois State Archaeological Survey), Richard L. Fishel (Illinois State Archaeological Survey), and Trudi E. Butler (Illinois State Archaeological Survey)

Chemical Analyses of the Ingredients of an 1850s Thomson’s Compound Syrup of Tar Patent Medicine Bottle

Chemical analyses were undertaken on the contents of a Thomson’s Compound Syrup of Tar and Wood Naphtha patent medicine bottle recovered during the archaeological excavation of a ca. 1850s house cellar at the Burning Sands archaeological site in Meredosia, Illinois. Chemical analysis included measurements of 13 metals, measurements of target polyaromatic hydrocarbons (PAHs), general scans by gas chromatography mass spectrometry (GCMS), and screening for four illicit drugs of abuse by high resolution GCMS. In addition to documenting numerous compounds associated with pine tar, the presence of cannabis was also detected. Many of the chemical compounds identified have antiseptic, analgesic, anti-inflammatory, and antitussive properties.

Mary L. Simon (msimon1@illinois.edu–Illinois State Archaeological Survey)

Understanding Maize History in Western Illinois: A Cautionary Tale

The history of maize in the Eastern Woodlands has been a topic of interest for well over one hundred years, since formalized plant studies began. During that time, our understanding of this history, and our interpretation of the role of maize in prehistoric North America, has changed significantly. At the same time, the tools we use in these evaluations have expanded from the study of the macroremains alone-- to include palynology, phytolith studies, isotope analyses, and chemical studies. All are useful, but it is important to realize that no single line of evidence is always adequately robust in formulating conclusions. In this presentation, I outline recent research that brings together macrobotanical, archaeological, and isotopic evidence to suggest that earlier, gradualist models for the spread of maize in western Illinois are no longer valid. This work highlights the importance of considering multiple lines of evidence in addressing archaeological questions.

Adam Sutherland (asuther2@illinois.edu–UIUC, Anthropology)

*2015 ATAM Minigrant Recipient

Exploring Diet in the Early Late Woodland Period: Stable Isotope Analysis of Absorbed Food Residues at the Apple Creek and Egan Sites

A major transition in the Midwest was the end of the Havana-Hopewell Tradition in Illinois. This tradition, based largely on an ideology that expressed itself as a thriving ceremonial practice, centered around burial mounds and earthworks during the Middle Woodland Period (100 BCE - 400 CE). As this period came to a close this ceremonial tradition began to melt away. The Apple Creek Site and the Egan Site represent places where this transition was directly experienced. One way to look at how this transition was negotiated is through dietary practices. This study uses stable isotope analysis to look at the dietary practices at these sites during the Whitehall Phase.
Adam Tufano (atufan2@illinois.edu—Illinois State Archaeological Survey)  
Lenna Nash (Illinois State Archaeological Survey), Steven Boles (Illinois State Archaeological Survey), and Amanda Butler (UIUC, Anthropology; Illinois State Archaeological Survey)

**What’s On This Earspool? Point and Shoot Elemental Detection using pXRF**
Portable x-ray fluorescence (pXRF) is becoming a must-have instrument within archaeology. The utility of XRF technology for formal provenance studies is well documented, but the pXRF is also a versatile tool that can be used for immediate, non-destructive elemental detection. This poster highlights one case of impromptu use that allows us to address questions of cultural practices involving the use of pigment. To address questions concerning the presence or absence of pigment (lead or hematite), elemental spectra were taken from several locations on the surface of a unique cranium earspool from the East Saint Louis site. Our results indicate that a ferrous pigment, likely hematite, is ubiquitous across the surface of this item that was ornamental and symbolic in nature.

Kathy Walsh (kawalsh@illinois.edu—UIUC, Materials Research Laboratory) and Natalie Becerra-Stasiewicz (UIUC, Materials Research Laboratory)

**Archaeologically-Relevant Techniques at the Materials Research Laboratory**
This review focuses on high-resolution imaging, chemical analysis, and mechanical characterization techniques available at the Materials Research Laboratory on the UIUC campus. Current and pending analytical capabilities will be discussed, including information on how to make use of the available techniques for archaeological research.

Kelsey E. Witt* (kewitt2@illinois.edu—UIUC, School of Integrative Biology) and Ripan S. Malhi (UIUC, Anthropology; Malhi Molecular Anthropology Laboratory)  
*2014 ATAM Minigrant Recipient

**Genetic Comparison of Ancient Dog Populations in the Americas**
The remains of domestic dogs have been found all over North America, and dogs were important to many Native American groups prior to European contact. However, little is known about how different dog populations in the Americas were related to one another across time and space. For this study, we sequenced the mitogenomes, or mitochondrial genomes, of 38 dogs from multiple archaeological sites in the Americas, with the goal of comparing population diversity between the groups. We found that some dog populations have high levels of diversity while others are much more homogeneous, suggesting a small founding population. No mitogenome sequences are shared between populations, and even populations from the same region but different time periods are very different from one another, suggesting that as human culture changed, the genetic makeup of the dog population changed too.
Ling Xue (xue@ustc.edu or 149936481@qq.com–School of Cultural Heritage, Northwest University, Xi’an City, China), You Yue (School of Cultural Heritage, Northwest University, Xi’an City, China), Ma Jian (School of Cultural Heritage, Northwest University, Xi’an City, China), and Wang Jianxin (School of Cultural Heritage, Northwest University, Xi’an City, China)

**Isotopic analysis of domestic mammals from Dongheigou, Xinjiang Autonomous Region, northwest China**

The first great empire of the Mongolian Plateau steppe grasslands of northwest China is the early Xi Han Dynasty (~2200-2000 bp). Bone collagen carbon and nitrogen isotopes of horses, cattle, sheep, dogs, camels and deer from the Xiongnu culture site of Dongheigou in Ba Li-kun County, Xinjiang Autonomous Region, were analyzed to improve dietary interpretations of human isotopic data. Low δ13C and δ15N values of horse, cattle, sheep, camel and deer show that C3 plants were their main food source. Camels had higher δ15N values than other herbivores, which may reflect their dietary and physiological adaptations to semi-arid environments. Dogs also had high δ15N values, like those of humans, which may reflect feeding on household food waste. The faunal and isotopic data suggest that Dongheigou people had a diversified subsistence economy involving complex pastoral herd management, hunting and cultivation of C3 crops.

Andrew Zipkin (amzipkin@illinois.edu–UIUC, Anthropology), Stanley Ambrose (UIUC, Anthropology), John Hanchar (Memorial University of Newfoundland, Canada, Department of Earth Sciences), Philip Piccoli (University of Maryland, Department of Geology), Alison Brooks (The George Washington University, Center for the Advanced Study of Human Paleobiology, Department of Anthropology), and Elizabeth Anthony (University of Texas at El Paso, Department of Geological Sciences)

**Elemental fingerprinting of Kenya Rift Valley ochre deposits for provenance studies of rock art and archaeological pigments**

Laser Ablation-Inductively Coupled Plasma Mass Spectrometry (LA-ICPMS) is increasingly used for minimally destructive compositional analysis and sourcing of the ferruginous pigments referred to as ochre. Sourcing, a key to past movement, trade and exchange networks, has proven challenging due to the diversity of ochreous minerals and the complex geogenic and diagenetic processes that form ochre. Attribution of samples to sources is possible only when chemical variation within sources is less than differences between sources (the Provenance Postulate). Here we present a study using LA-ICPMS to determine the elemental composition of ten ochre sources associated with three volcanic centers in the Kenya Rift Valley. Our results show that differences between sources are greater than variation within sources, at the scale of volcanic centers and for outcrops within those centers. This region contains many ochre deposits that are still used by local peoples, and archaeological and rock art sites with ochre pigments.
2016-2017 ATAM Student Mini-Grants in Archaeometry

The ISAS Program on Ancient Technologies and Archaeological Materials (ATAM) Student Mini-grants in Archaeometry are intended to assist UIUC undergraduate and graduate students complete theses, capstone or other projects involving instrumental analyses of archaeological or art historical materials. Awards will not exceed $500 and are to be used for analysis conducted at UIUC laboratories/facilities. Funding is provided by ISAS, a Division of the Prairie Research Institute. Collaborative projects are encouraged and students outside of archaeology are urged to apply.

Requirements for application:

- Applicant must be a currently enrolled UIUC undergraduate or graduate student.
- Proposal will include a 1-2 page summary clearly stating the research question(s) to be addressed, the archaeological or art historical context and significance, and the technique(s) to be employed. A budget for the proposed analysis must also be included. Names and contact information for two faculty members who will provide letters of reference will be required.
- Applications must be submitted electronically to ATAM Assistant Director, Dr. Kristin Hedman. Forms for applying for the 2016-2017 Mini-Grants will be available on our website in August.
- Applications will be evaluated by the ATAM Advisory Committee (and relevant specialists).

Requirements of awardee:

- Present results at either the ATAM Science and Archaeology Symposium in February 2018 or at an ATAM Brown Bag in the spring.
- Submit a written report upon completion of the project detailing how the money was used in the context of the project.
- Agree to allow publication of the submitted material (ISAS-ATAM website, newsletter, annual report, etc.), and agree to mention ISAS-ATAM grant assistance in reports/publications.

Application forms will be available on our website in August.

www.isas.illinois.edu/atam

Application Deadline: 30 September 2016
Award Notification: 28 October 2016
## ATAM Minigrant Recipients

<table>
<thead>
<tr>
<th>Name</th>
<th>Project Title</th>
<th>Department</th>
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<tbody>
<tr>
<td><strong>2015-2016</strong></td>
<td></td>
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<tr>
<td>Montana Martin</td>
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<td>Kelsy Witt</td>
<td>Ancient DNA Analysis of Mississippian Dogs in the American Bottom</td>
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<td><strong>2013-2014</strong></td>
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<td>Jessica Harrison</td>
<td>Comparison of Pretreatment Methods for Isotopic Analysis of Organic Residues in Carbonate-Contaminated Pottery</td>
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