

# BACKDIRT

ANNUAL REVIEW OF THE COTSEN INSTITUTE OF ARCHAEOLOGY AT UCLA  
DECEMBER 2016



THE **LAB ISSUE**







# BACKDIRT

ANNUAL REVIEW OF THE COTSEN INSTITUTE OF ARCHAEOLOGY AT UCLA

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**FRONT COVER:** A shell midden under analysis. Each small box contains a different category of shell, bone, or artifact. This image evokes both the tedium of the work and the relief when it is finished. (Photograph by Scott Sunell)

**BACK COVER:** The incoming director of the Cotsen Institute, Willeke Wendrich, next to the outgoing director, Charles (Chip) Stanish.

**ABOVE:** “Meanwhile, Back at the Ranch” – Photo by Hans Barnard.

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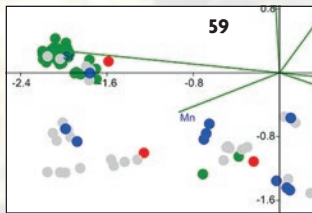
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# Message from the Director of the Institute

FOR FIFTEEN YEARS, Charles (Chip) Stanish was director of the Cotsen Institute of Archaeology. His tenure was immensely successful and brought financial stability to the institute, which has grown and now houses archaeologists and conservation specialists from 10 departments and six schools at UCLA. Graduate students have the unique opportunity to obtain experience with archaeology worldwide by working in regions very different from their main research foci. Students specializing in Andean and Chinese archaeology have worked with me in Egypt, while students of Egyptology have worked in Peru and China.

On July 1, 2016, I assumed the task of leading the institute. At the beginning of my tenure, I am speaking with all members of our community to gauge expectations, listen to wishes, and collect ideas. It is worthwhile to keep the foundations of the institute in mind and to remember why we come together from different parts of the campus. The ability to develop initiatives with colleagues working in different regions of the world enriches all of us, as the ongoing discourse of different research questions and methodologies stimulates us to look at our research with fresh eyes. At a time when there was no building and no funding, a time when Lloyd Cotsen was contributing to archaeology with manual labor by excavating and by experimenting with kite photography, the institute was an idea and a community of hearts and minds. We are now at a different stage, with a dedicated building and funds. It is always important to keep working on our core tasks, however. These are both material and immaterial, including a constant and lively exchange of views, as well as education, outreach, and publication.



I have worked in Egypt, Ethiopia, Peru, Turkey, and Yemen, where I met people who deeply affected the way I stand in the world. The treasure of archaeology is not just the old stuff but also the powerful impetus of studying ancient people while interacting on a daily basis with present-day living ones. The Cotsen family is a worldwide community because we all have friends in distant, or not-so-distant, places. We all have been touched by and have touched the lives of others, and when we return to UCLA, not only do we have data to crunch, but most of all we have experiences and stories to share. Some of these stories you will find in the following pages, where affiliates of the institute divulge what they do “back at the ranch.”

A handwritten signature in black ink, appearing to read 'Willeke'.

Willeke Wendrich  
Director, Cotsen Institute  
of Archaeology  
Lloyd Cotsen Chair in  
Archaeology

### The Marilyn Beaudry-Corbett Endowed Chair in Mesoamerican Archaeology

During the 2015–2016 academic year, Richard Lesure was installed as the inaugural Marilyn Beaudry-Corbett Endowed Chair in Mesoamerican Archaeology. This position enabled Lesure and a team of collaborators and students to work in the laboratory of the New World Archaeological Foundation in Chiapas, Mexico, during the summer of 2016. Here they started assembling a database of early ceramic imagery from the Soconusco region of Chiapas, an area particularly important for understanding the origins of Mesoamerican civilizations, with a well-defined pre-Olmec occupation that underlies the spectacular Olmec culture. This tradition includes abundant human figurines and animal effigies, prompting Lesure to ask: What artistic themes preceded the Olmec style in Mesoamerica? Were those themes transformed or merely abandoned with the shift to Olmec-style imagery? The widespread dissemination of Olmec art starting around 1400 B.C. is widely seen as leading to the genesis of Mesoamerica as a culture area. The large corpus of pre-Olmec art from Soconusco provides Lesure and his collaborators an opportunity to look in detail at expressive traditions older than 1400 B.C.

— *Richard G. Lesure*



Graduate student Kate Bishop and Richard Lesure assemble a database of early ceramic imagery from the Soconusco region (Mexico) in the summer of 2016.



## The Navin and Pratima Doshi Chair in Indian Studies

The Navin and Pratima Doshi Chair in Indian Studies was established at UCLA in 1998 with the intent of highlighting the history of the Indian subcontinent and with the support of the Indian community of Los Angeles. Navin Doshi was a graduate student at UCLA, and he and his wife, Pratima Doshi, have had successful careers in engineering and real estate management, respectively. After taking turns in the Department of History, the Doshi Chair is now held by Monica L. Smith, a faculty member in the Department of Anthropology and founding director of the Laboratory of South Asian Archaeology at the Cotsen Institute.

Inaugurated in October 2015, Smith's chair has been put to work in a variety of ways to benefit colleagues and students at UCLA and beyond. Special events supported by the chair's funds have included visits by Jonathan Mark Kenoyer of the University of Wisconsin–Madison, who spoke on the Indus bead trade, and Edward Pollard of the British Institute in East Africa, who lectured on the marine archaeology of the Indian Ocean. In May 2016 Smith delivered the inaugural D. R. SarDesai Memorial Lecture to honor Damodar (Bala) SarDesai, who held the first Doshi Chair. This was a fitting tribute to the diversity of scholarship in South Asian studies on our campus and the close ties between history and archaeology in the study of the subcontinent. Elsewhere at UCLA, chair funds were used to cosponsor lectures with the Center for India and South Asia and the first graduate student conference on South Asian studies.

The Doshi Chair is also being used to support scholarship and networking for early-career researchers beyond UCLA. In June, Smith conducted a workshop with four recent PhD grantees from top North American universities where South Asian archaeology is taught (Chicago, Michigan, Toronto, and Wisconsin). This weeklong intensive workshop was designed to distill the participants' dissertations into competitive articles for top scholarly journals. Doshi Chair funds were also used to support participation of members of the joint Deccan College–UCLA research team and two UCLA students at the European Association of South Asian Archaeology Conference in



Jonathan Mark Kenoyer of the University of Wisconsin–Madison demonstrates the use of molding techniques for recording ancient beads during a lecture at the Center for India and South Asia sponsored by Doshi Chair funds.



Scholars and students attended the European Association of South Asian Archaeology Conference with the support of the Doshi Chair. Pictured are R. K. Mohanty (Deccan College, Pune), Steven Ammerman (UCLA Anthropology), Monica L. Smith (UCLA Anthropology), Sikhashree Ray (Archaeological Survey of India), Tilok Thakuria (Northeast Hill University), and Anjum Malik (UCLA Archaeology IDP).

Cardiff, Wales, in July 2016. This biannual conference is the major international meeting of the field, and the attendance of Smith, R. K. Mohanty, and their team further highlighted the strong international visibility of UCLA in studies of the ancient Indian subcontinent. The establishment of endowed chairs such as the Doshi Chair represents a growing awareness of the role of community participation in research, public outreach, and student support. The Cotsen Institute is highly appreciative of the donors for recognizing and celebrating the past of the Indian subcontinent in this way, and we warmly thank Navin and Pratima Doshi for their vision and dedication.

— *Monica L. Smith*

## THE INSTITUTE IN THE NEWS



A fine masonry building at Machu Picchu.  
(Photo by Stella Nair)

### Rome Prize and Guggenheim Fellowship for Stella Nair

Cotsen core faculty member Stella Nair was recently awarded two fellowships: a Rome Prize from the American Academy in Rome and a Guggenheim Fellowship from the John Simon Guggenheim Memorial Foundation. The Rome Prize is awarded each year to scholars, architects, writers, and artists “who represent the highest standard of excellence and who are in the early or middle stages of their working lives,” according to the American Academy’s website.

Trained as an architect and architectural historian, Nair will be in residence at the American Academy in Rome to study firsthand the ancient Roman buildings used by early colonial writers to describe Inca architecture. As an understanding of Roman architecture influenced many early colonial writers of Inca

architecture, the knowledge gained from this fellowship will impact Nair’s future scholarship on the Inca, including her next monograph, *Shelter, Shrine, and Prison: The Acclauasi and Other Spaces for Women in the Inca Empire*. Nair will conduct the research necessary for this project with support of the Guggenheim Foundation. Specifically, she will examine the architecture of several extant *acclauasi* (Houses of the Chosen Women) in present-day Peru and will consult archival sources and other early colonial writings from Peru and Spain related to these spaces. The resulting manuscript will be the first in-depth study of the architecture of the *acclauasi* and of female space in the Inca Empire.

Nair is honored to have been awarded a Rome Prize and a Guggenheim Fellowship, the latter “intended for men and women who have already demonstrated exceptional capacity for productive scholarship or exceptional creative ability in the arts,” explains the foundation’s website.



Tehran University, with banners advertising the congress.



## The International Congress of Young Archaeologists in Iran

Elizabeth Carter and four UCLA students attended the International Congress of Young Archaeologists, held at Tehran University, Faculty of Humanities, from October 15 to October 17, 2015. Carter was a member of the scientific committee for the congress, and current and former UCLA students presented their research. Amy Cromartie, a UCLA undergraduate and now a graduate student at Cornell, spoke on “Shared Ritual Ideologies: Long Spouted Vessels on the Iranian Plateau.” Evan Carlson, a doctoral student in the UCLA Archaeology Program, presented a paper called “Refocusing Regional Interaction Under the Kings of Anshan and Susa: A Study of City and Canal Construction in the Late Second Millennium B.C.” Hannah Lau, also a doctoral student in the UCLA Archaeology Department, presented “Assessing Emergent Political Complexity through Faunal Remains: Cooperation and Feasting at Halaf Domuz-tepe.” Joseph Lehner, a postdoctoral scholar at Koç University in Turkey and a recent UCLA graduate, gave a paper on “The Rise of Tin Bronze Metallurgy



Evan Carlson and Joseph Lehner visit the statue of Darius the Great in the National Museum in Tehran.



Graduate students Amy Cromartie, Hannah Lau, and Sam Harris stroll across the Tehran University campus with Dr. Emily Hammer of the Oriental Institute leading the way.

in Anatolia.” In addition to presentations by Iranian and international students, Iranian archaeology students performed a short comic play about their lives at the university. At the end of the congress, Evan Carlson and Joseph Lehner were able to visit sites in Khuzestan, accompanied by Abbas Alizadeh of the University of Chicago.

Elizabeth Carter gave a lecture in honor of Shapur Malek Shamirzadi, professor emeritus of Tehran University. She also attended meetings at the Iranian Center for Archaeological Research (ICAR) and at Tehran University, where preliminary discussions about establishing future cooperation between our institutions were held. All in all, the meetings were successful in bringing us into closer contact with our Iranian colleagues and informed us about active programs in archaeology run by both universities and ICAR in Iran.

We thank the Cotsen Institute of Archaeology and the Iranian Studies Program at UCLA, which supported our trip.

— Elizabeth Carter

## THE INSTITUTE IN THE NEWS



Marco Rossi, Marilyn Kelly-Buccellati, Andrea Simoncini, and David Lordkipanidze take part in the panel discussion in Rimini on August 19, 2016.

### Exhibition and Panel Discussion on Georgian Cultural Heritage at the 2016 Rimini Meeting

In August 2016, Marilyn Kelly-Buccellati organized an exhibit on Georgia at the Rimini Meeting, a large cultural festival in Rimini, Italy. Ca' Foscari University in Venice is conducting an archaeological expedition at Aradetis Orgora in the Republic of Georgia. Marilyn is part of the expedition and curated the exhibit in cooperation with the Georgian National Museum. It included eight rooms of didactic panels, re-created samples of Georgian writing, and a number of casts of gold jewelry found during the excavation

of Vani. David Lordkipanidze, director of the Georgian National Museum, attended the opening of the exhibit, which was introduced by Andrea Simoncini, professor of constitutional law at the University of Florence. This was immediately followed by a panel discussion between David, Marilyn, Andrea, and Marco Rossi, professor of history of medieval arts and director of the postgraduate school of cultural heritage at Catholic University of the Sacred Heart in Milan. During the week of the exhibit, more than 12,000 people visited, and the panel discussion on August 19 drew an audience of at least 700. The Rimini Meeting was opened by Sergio Mattarella, the president of Italy, and Marilyn was able to organize a short meeting between him and David.

— Marilyn Kelly-Buccellati and Giorgio Buccellati



## Launch of *The Archaeology of Grotta Scaloria* in Orlando

At the Society for American Archaeology meeting in Orlando, Florida in April 2016, the Cotsen Institute of Archaeology Press was pleased to announce the publication of *The Archaeology of Grotta Scaloria: Ritual in Neolithic Southeast Italy*, particularly because it gave us a chance to celebrate Ernestine Elster, a Cotsen associate and visiting assistant professor. In collaboration with three coeditors (including John Robb), she located much of the legacy data of this Neolithic cave site in Apulia, Italy. The data came from the Marija Gimbutas Archive, which was scattered all over the world, mostly in Montecito, California, but also in Rome, the Philippines, Mississippi, Alabama, and elsewhere. This was a great challenge, not least because one of the two principal archaeologists on the project, Gimbutas, had already passed away and the other, Santo Tiné, passed away while the manuscript was being prepared.

Grotta Scaloria was first discovered and explored in 1931. In 1967 Luigi Coppolecchia and other young speleologists entered the Upper Chamber of Scaloria Cave and bravely followed the dark and twisting path to the until-then-unknown Lower Chamber. This discovery brought Santo Tiné to the cave and a decade later Maria Gimbutas and her UCLA students.

Scaloria Cave was excavated briefly in 1967 and extensively from 1978 to 1980 by a joint UCLA–Uni-



Ernestine Elster and John Robb at the presentation of their book in Orlando, Florida.

versity of Genoa team, but it was never fully published. The coeditors oversaw the writing of chapters by more than 30 contributors, and the path to publishing took a dozen years. Elster has referred to this work as “excavating the excavation.” It could also be termed “rescue archaeology,” as the material was certainly rescued from the far-flung and dark recesses of boxes and filing cabinets.

This impressive achievement will hopefully be an inspiration to archaeologists facing the demanding and thoroughly daunting task of evaluating, analyzing, describing, tabulating, drawing, photographing, and finally publishing data from an excavation. The Grotta Scaloria project is also important as historiography, since it illustrates a changing trajectory of research spanning three generations of European and American archaeology. The authors were able to apply new methods of archaeological and scientific analysis to the material, bringing it up to date. See the publications report in this issue for more details on this wonderful and important book.

— *Randi Danforth*

## The Bodily Impact of State Collapse in Ancient Peru

*Danielle S. Kurin*

NESTLED IN THE PERUVIAN ANDES, Wari was the first expansive empire to emerge in the Americas (circa A.D. 600–1000). Its eponymous capital city housed some 30,000 residents, and colonial outposts and trade relationships were established in newly conquered areas. By around A.D. 700, Wari installations began to speckle the steep slopes of a productive and prosperous hinterland province called Andahuaylas, famed for its mineral wealth and attendant pack animal (llama) husbandry. Yet for reasons still unknown, Wari tumultuously disintegrated. By the dawn of the thirteenth century (as the Magna Carta was being signed an ocean away), the Andean empire lay in ruins.

In Andahuaylas, imperial collapse entailed the abandonment of Wari-affiliated sites and the breakdown of road networks, the repudiation of Wari-style goods, and clear signs of civil unrest (Arkush and Tung 2013; Schwartz and Nichols 2006:3–17). Most noteworthy, hill fort refuges were abruptly established

Research takes place in an unassuming laboratory in Santa Barbara.

on precipitous ridgetops. Defensive features included ditches, lookouts, and ringed walls. Within the walls, circular houses were haphazardly arranged; overall living conditions were crowded and disorderly. History calls these hill fort dwellers the Chanka, and their plight was most thoroughly chronicled in sixteenth- and seventeenth-century colonial texts.

Claiming mythical origins in a land far from Andahuaylas, the Chanka in their later days infamously attempted to subdue the Inca of Cuzco but were ultimately vanquished in battle. While the spectacular rise of the bellicose Chanka from the ashes of the ruined Wari Empire seems to find support in both documentary and archaeological accounts, directly



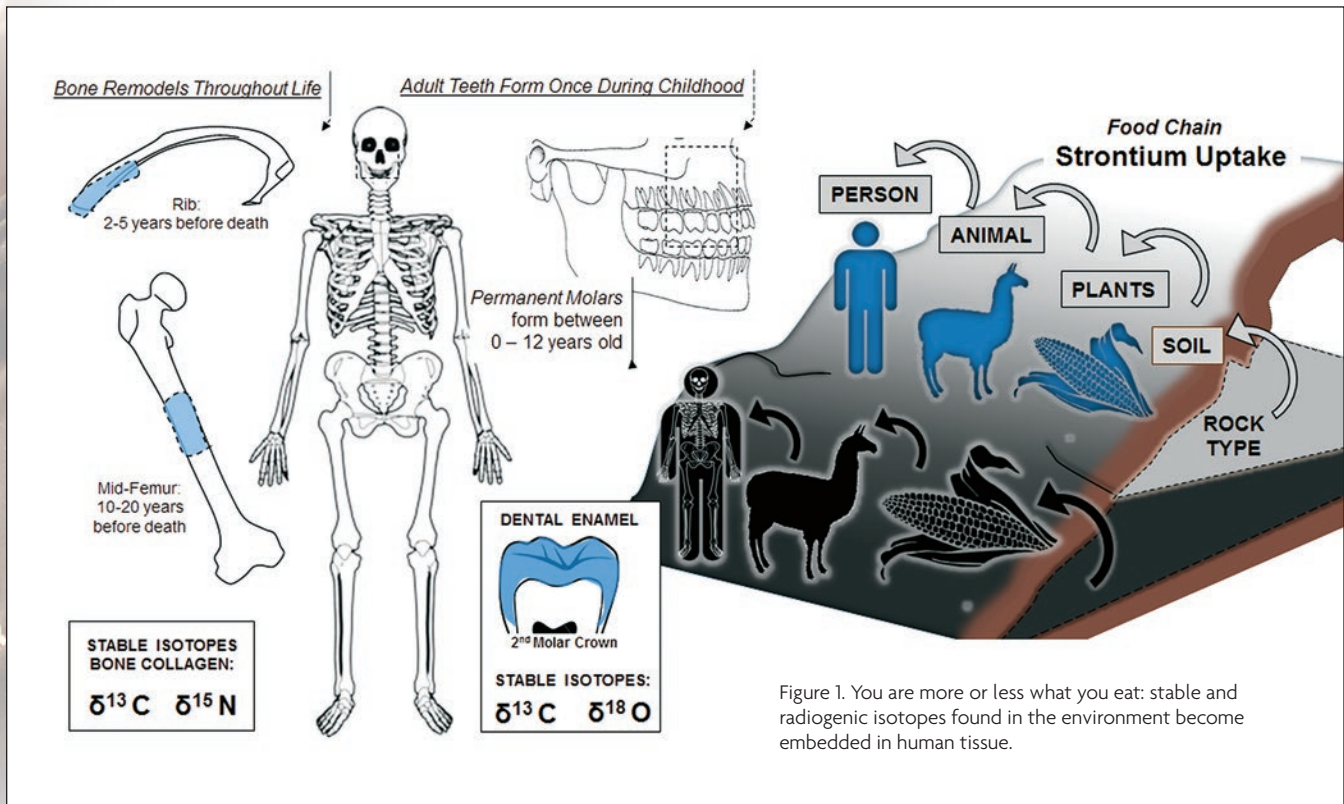


Figure 1. You are more or less what you eat: stable and radiogenic isotopes found in the environment become embedded in human tissue.

reconstructing the lived experiences of actual Chanka people largely takes place thousands of miles from the precipitous Peruvian Andes, in an unassuming laboratory near the beaches of Santa Barbara.

#### OUT OF THE TOMB AND INTO THE LABORATORY

At UC Santa Barbara, the whine of a drill and an acrid smell emerges from the Phillip L. Walker Bioarchaeology and Biogeochemistry Laboratory. Inside the lab and impervious to the sensory distractions, PhD student Anna Gurevitz (UC Merced) hunches at a bench, carefully crafting submillimeter-sized troughs in the crown of a bulbous molar. The tooth powder that floats off the diamond bit and lands on gossamer weighing paper will eventually find its way to a small centrifuge vial and several servings of chemical soup, which will violently wrest stable and radiogenic isotopic elements from the petrified enamel matrix. On the other side of the lab, visiting scholar Jacob Bongers (ABD UCLA) traces his finger over the swollen, bony brow of a skull. The robustness of this feature helps indicate male or female sex (Buikstra and Ubelaker 1994). These data—along with dozens of other observations—are entered into a digital database that contains “autopsy” information on hundreds of archaeological individuals represented by tens of thousands of ancient, mostly fragmentary, dry brown bones excavated in Andahuaylas over the past decade.

The work for bioarchaeologists usually begins

## The failure of states seems to exacerbate particular social phenomena.

once human remains, usually skeletonized but sometimes mummified, are exhumed. Reconstructing past lifeways via human remains is best achieved using a bevy of laboratory-based approaches, from relatively low-tech skeletal observations to more intensive and invasive techniques drawn from biology, chemistry, and the earth sciences. Far from glamorous, this is meticulous, dirty, and time-consuming work. Yet a focus on human bodies—from the molecules in a single tooth or bone to entire archaeological communities—allows us to address how issues of anthropological significance impact actual people, from kings to commoners. The case of Wari societal collapse and Chanka origins in Andahuaylas aptly demonstrates how this lab-based approach works.

Regardless of place or epoch, the “failure” of states seems to exacerbate particular social phenomena. These almost always include widespread outbreaks of violence. Also ubiquitous are novel pop-

ulation movements such as invasion, displacement, flight (of refugees), and abduction. Finally, as current events have shown (for instance, in Iraq, Syria, and Venezuela), when governments become ineffective or topple, even basic supplies become scarce. Blocked or destroyed transport and communication networks inhibit access to food, water, and medical aid. As illustrated by circumstances in Haiti after the 2010 earthquake and in New Orleans following Hurricane Katrina, acts of God, willful sabotage, or negligent inefficiency may further limit local availability of life-sustaining resources.

### TRACING POPULATION MOVEMENT

Contemporary and historic examples of imperial decline have coincided with widespread population displacement and isolation, but was that the case in ancient Andahuaylas? We approach this question in the lab through the use of epigenetic traits—observable attributes that reflect characteristics passed from parent to child (think Kennedy Family teeth or the Habsburg jaw). People who share traits are thought to share hereditary codes, and common heredity is a measure of biological relatedness. Additionally, because there is finite variation in how epigenetic traits are expressed, they inform on gene flow—the exchange of genes between populations (Cheverud et al. 1979). Naturally, a consequential factor that affects gene flow is mobility—people migrating in or moving out of a population.

Statistical analyses of epigenetic traits culled from more than 200 Andahuaylan skulls have illuminated trends in population movement that contradict old colonial tales of invading warriors from distant lands. While Wari-era populations in Andahuaylas demonstrated some biological affinity with people from the imperial capital, post-collapse Chanka people were not invaders but rather locals, the direct descendants of earlier Andahuaylans. Crucially, unlike their imperialized ancestors, the stateless Chanka experienced significantly greater isolation (less gene flow) as a consequence of a balkanized social landscape (Pink 2013).

Given these results, we decided to probe deeper and to directly trace mobility within the population. Identifying individual immigrants among ancient skeletons required us to make use of advances in biogeochemistry and to focus on the element strontium. Stable strontium ( $^{86}\text{Sr}$ ) occurs naturally in bedrock all over the world. As eons pass, another common element in bedrock, rubidium ( $^{87}\text{Rb}$ ), slowly and variably

decays into an isotope: radiogenic strontium ( $^{87}\text{Sr}$ ). The ratio of stable to radiogenic strontium ( $^{87}\text{Sr}/^{86}\text{Sr}$ ), called the strontium *signature*, is therefore unique to a specific geologic locale. As bedrock erodes into soil, the  $^{87}\text{Sr}/^{86}\text{Sr}$  mixture enters the food chain, eventually becoming embedded in the hard enamel that forms in a developing tooth crown during childhood (Figure 1). Assuming an individual ate locally grown foods, the strontium signature in teeth directly reflects that local geology. Accordingly, foreigners (or nonlocals) can

## Statistical analyses have illuminated trends in population movement.

be identified by outlying or aberrant dental  $^{87}\text{Sr}/^{86}\text{Sr}$  values. This approach thus allows us to geographically source individuals and also to trace patterns of migration within a single, ancient lifetime (Bentley 2006).

Our assessment of almost four dozen dental samples showed that despite some epigenetic trait affinity with the Wari capital region, there are no signs of foreign-born colonists in Andahuaylas. Nor do we find isotopic evidence of mass population exodus once Wari disappears. Of the Chanka skeletons sampled, less than 10 percent were born in foreign lands. More ominous yet, these “émigrés” likely arrived in Andahuaylas unwillingly. Why? Because these  $^{87}\text{Sr}/^{86}\text{Sr}$  isotopic outliers were all linked to young women from distinct geographic regions, and this demographic group id was most often targeted for kidnapping and abduction, even today. The women also have healed wounds on the backs of their heads, the result of attempted (and ultimately unsuccessful) flight from captors. Under the lens, their battered bodies display the pockmarks of disease and a bricolage of broken bones, features often observed in cases of post-apprehension abuse and chronic mistreatment.

### ASSESSING BONES OF CONTENTION

Along with major demographic collapse, endemic violent conflict is often cited as both a cause and a consequence of state failure. For bioarchaeologists, head wounds (also termed skull fractures or cranial trauma) represent the clearest indication of intentional physical



assault (Walker 2001). Therefore, meticulously documenting trauma location, lethality, and frequency is a crucial part of the work we do in the lab.

Our cranial trauma results confirm that conflict was relatively rare in Andahuaylas during the Wari imperial era (a *Pax Wari*); less than 8 percent (2 of 26) of crania bore evidence of injury. Yet after collapse, rates of violence skyrocketed. Fifty-seven percent of the population exhibited head wounds ( $p < 0.0001$ ;  $n = 269$ ). Assaults also became much more deadly ( $p = 0.0036$ ). While there are no lethal skull fractures present during the Wari era, more than a fifth of those studied from the subsequent Chanka era received a serious head wound that resulted in death.

Despite its apparent ubiquity in the post-collapse era, violence actually varied greatly within Chanka society. For instance, the *Piwi Churi*, an elite caste composed of firstborn, legitimate, and favored children, escaped the worst conflict. Thirty-two percent of *Piwi Churi* skulls ( $n = 50$ ) exhibit wounds, the majority of which were not lethal. Far greater misery was experienced by the majority *Wakcha* caste. These men and women were conspicuously marked by their artificially elongated heads, which signaled birth from “women of low extraction” (Betanzos 2004 [1557]:68–71) (Figure 2). Violence was pervasive within this group and genocidal in nature: an astonishing 61 percent of *Wakcha* teens and adults exhibited head wounds ( $n = 160$ ;  $p = 0.0006$ ), and it was solely children from this particular caste who experienced intentional physical abuse. Moreover, the presence of both antemortem (healed) and perimortem (unhealed) trauma on individual skulls proves that the *Wakcha* were victims of repeated—and ultimately deadly—assaults. Many also exhibit blown-out holes called ring fractures on the base of the skull. These wounds typically occur when a kneeling captive with a bowed head is subjected to lethal, blunt-force trauma from a standing assailant. Finally, other *Wakcha* skulls were intentionally, completely, and excessively shattered. This type of trauma, called overkill, reveals an odious homicidal intent to physically and symbolically obliterate a victim.

#### COPING WITH FOOD INSECURITY

Those Chanka who survived the violence still suffered other types of hardship. In this case, a creative laboratory technique—stable isotope analysis—illustrates how state collapse impacts access to potable water and diverse, nutrient-dense foods (VanDerwarker and Wilson 2016). Stable isotope analysis can extend to



Figure 2. Lethal, perimortem (unhealed) trauma on an artificially modified cranium.

ratios of oxygen and carbon element to isotopes fixed in dental enamel, similar in principle to strontium uptake (Lee-Thorp et al. 1989). Oxygen isotope signatures (annotated as  $\delta^{18}\text{O}_{\text{apatite}}$ ) are thought to reflect local drinking water (Knudson 2009). Lower oxygen signatures are present at higher altitudes, while lower elevations yield higher oxygen values. The direct relationship between oxygen isotopes and elevation proved key in our particular study.

Carbon isotope analysis relies on the fact that different plants synthesize organic molecules in distinct ways (Kellner and Shoening 2007). Native Andean foods such as potatoes and quinoa use what is known as the  $\text{C}_3$  photosynthetic pathway, while maize maintains a different conduit, called the  $\text{C}_4$  pathway, which can be further enriched in humans by eating land mammals that feed on corn fodder (Turner et al. 2009). Carbon isotope values gleaned from our extraction efforts in the lab reflect the ratio of  $\text{C}_3$  to  $\text{C}_4$  foods in an individual's diet (annotated as  $\delta^{13}\text{C}_{\text{apatite}}$ ).

In mountainous Andahuaylas, we can creatively marshal oxygen and carbon isotope data to trace diet, and by extension mobility, precisely because water sources are few and far between and because different foodstuffs thrive only in particular elevation-dependent ecological zones (Murra 1972). For example, maize grows in river valleys, 2,000 to 3,200 m above sea level, while potatoes are cultivated between 3,200 and 3,800 m above sea level. Likewise, the main sources of drinking water for those hunkered in Chanka hill forts were lower-elevation springs or

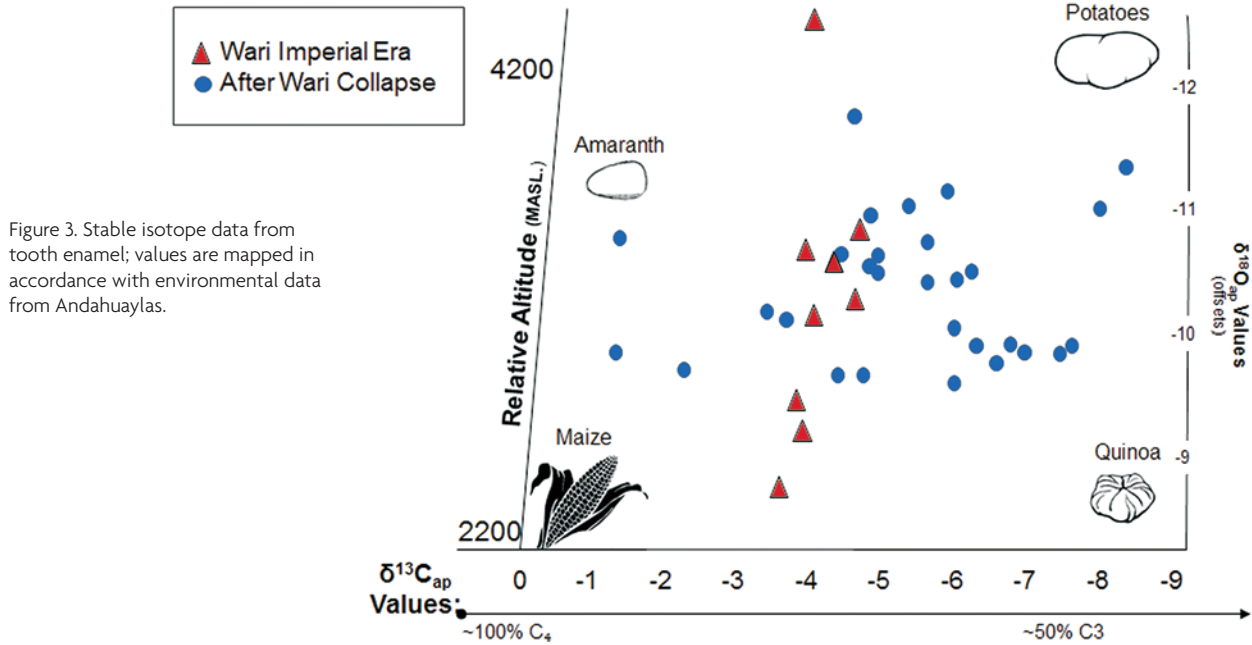


Table 1. Carbon and Oxygen Stable Isotope Data from Andahuaylas.

ERA	SAMPLE SIZE	$\delta^{13}\text{C}_{\text{apatite}}$ RANGE	$\delta^{13}\text{C}_{\text{apatite}}$ MEAN	$\delta^{18}\text{O}_{\text{apatite}}$ RANGE	$\delta^{18}\text{O}_{\text{apatite}}$ MEAN
Before Wari collapse	9	-4.91 to -3.71‰	-4.20‰	-12.69 to -9.04‰	-10.48‰
After Wari collapse (Chanka)	34	-1.54 to -8.47‰	-4.89‰	-11.28 to -8.47‰	-9.50‰

rivers. Some 2 km upslope, glacial and marsh water sustained herders in high-altitude grasslands. Plotting both oxygen and carbon isotopic values helps reveal what people were eating and consequently which ecological zones they were able to access in an extremely precipitous landscape (Figure 3).

In the lab, we culled element-rich mineral apatite from the enamel crowns of several dozen teeth. Our processed data exposed a key transformation in local nutritional trends (Table 1). While average carbon isotope values are consistent over time, corresponding ranges increase dramatically. In other words, before Wari collapse, all Andahuaylans maintained a similar diet. After collapse, diets became unequal. Even within families, differences in  $\delta^{13}\text{C}_{\text{apatite}}$  values demonstrate an alimentary disparity equivalent to one meal a day, every day, for years. Furthermore, while the expansive oxygen isotope range of the imperial-era population highlights substantial individual movement to far-flung ecological sectors, the narrow post-collapse  $\delta^{18}\text{O}_{\text{apatite}}$  range signals restricted mobility. Simply put, after Wari collapsed, access to (drinking

water in) different productive zones—from humid valley to high plateau—was severely reduced.

Finally, despite archaeological evidence of llama husbandry in Andahuaylas (Bauer et al. 2010), these camelids may not have been a common item on the

## After collapse, diets became unequal. Even within families.

Chanka menu. The question of whether or not llama was eaten is subject to analysis of carbon and nitrogen isotopes embedded in skeletal collagen, an organic component that gives bone its flexibility (Longin 1971). The ratio of carbon to nitrogen is linked to the diet of a consumer and its place on the food chain (Figure 4). Unlike inorganic dental crowns, which



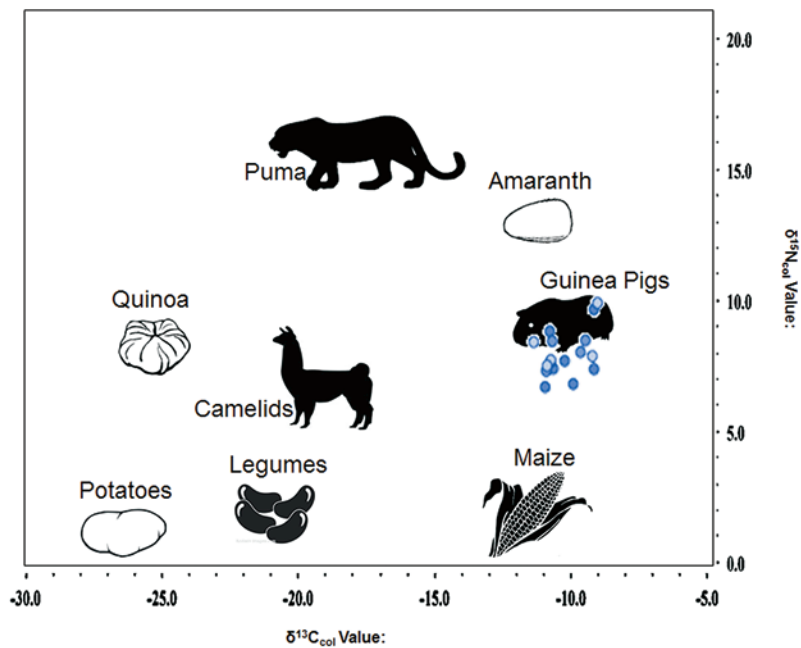


Figure 4. Stable isotope data culled from bone collagen and mapped onto the local Andean food web.

only and permanently form in the first years of life, bone is living tissue: new bone cells constantly replace old ones. The elemental signatures we wrest from bone thus provide a snapshot of what someone ate in the years before death (Sealy et al. 1995).

Our collagen extraction results show that the Chanka derived crucial animal protein from C<sub>4</sub>

(maize) consumers located on the lower rungs of the Andean food chain. The likely source of this protein was the locally important yet archaeologically under-represented guinea pig. Unlike the fastidious and conspicuous llama, guinea pigs scavenge human-generated table scraps and plant waste, such as cornhusks and cobs, and are raised *en masse* in the home. This makes sense. In a milieu where half the population is experiencing violence and a third is dying from it, reliance on food cultivation within the confines of a hill fort house is a logical, safety-conscious subsistence strategy.

#### THE CONSEQUENCES OF LIVING DANGEROUSLY

The wealth of information garnered by our lab work illuminates a long-forgotten history of suffering and survival in the ancient Andes. First, while epigenetic skeletal data attest to some affinity between Andahuaylas and the Wari heartland, strontium signatures prove that there were no foreign-born imperial colonists in the region. When the Wari state finally disintegrated, local populations were not replaced and did not disappear. Instead, descendant communities were internally displaced into hill forts, which contributed to population isolation and balkanization. Collapse also created a political power vacuum, exacerbating group factionalism. Competition soon turned violent and ultimately resulted in legions of walking wounded, war dead, and unwilling captives.

Within the emergent Chanka society, some factions were conspicuously and permanently signaled by head shape, which transmitted a wealth of social information. Tragically, it appears that the social obligations



Figure 5. PhD candidate Davette Gadison (Tulane University) examines an artificially modified cranium for signs of disease. Her research explores the underlying causes of poor health in proto-historic Andahuaylas.

associated with a modified head specifically increased the likelihood of being drawn into conflict, while the salience of an elongated skull made it an easy target for vicious attack. Crucially, this study proves that despite widespread turmoil, when social disasters strike, the impacts are not experienced equally by all.

This is also true with respect to the acquisition of basic necessities. Isotope data from Andahuaylas demonstrates that food accessibility transforms markedly in the wake of Wari collapse. Narrow oxygen isotope ranges point to reduced individual access to outlying ecological zones, while wide carbon isotope ranges highlight vastly unequal diets within a single family. Finally, household survival depended on reliably procuring food, so the Chanka strategically intensified home-based guinea pig husbandry rather than taking llamas to pasture in desolate no-man’s-lands. Given that tensions were high and resources few, travel outside the hill fort walls was a risk that endured for generations. While the ultimate fate of the Chanka remains unclear, the tortured genesis of the Chanka culture, born of imperial ashes, is a spectacular

example of societal reorganization and resilience.

More broadly, bone-focused research allows us to address questions of profound social significance using innovative, multi-pronged laboratory approaches and ever-smaller sample sizes. Using the human body as the main unit of analysis enables us to directly reconstruct the life histories of individuals—and ultimately entire populations—over the course of centuries. Data that result from lab-based skeletal and isotopic studies offer a perspective not captured by archaeological or historical data alone and help us more precisely document and interpret meaningful social behaviors and their biophysical outcomes in the prehistoric past.

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Figure 7. Kassie Sugimoto (MA North Carolina State University) configures a microscribe, an instrument that allows the creation of a quantifiable, three-dimensional digital image. Kassie is testing the hypothesis that childhood illness causes facial asymmetry in adults.



Figure 6. Ashleigh Lopes (BA UC Santa Barbara) uses a portable X-ray fluorescence Tracer (a “reverse recipe instrument”) to detect the presence of toxic metals in the bones of ancient copper miners.



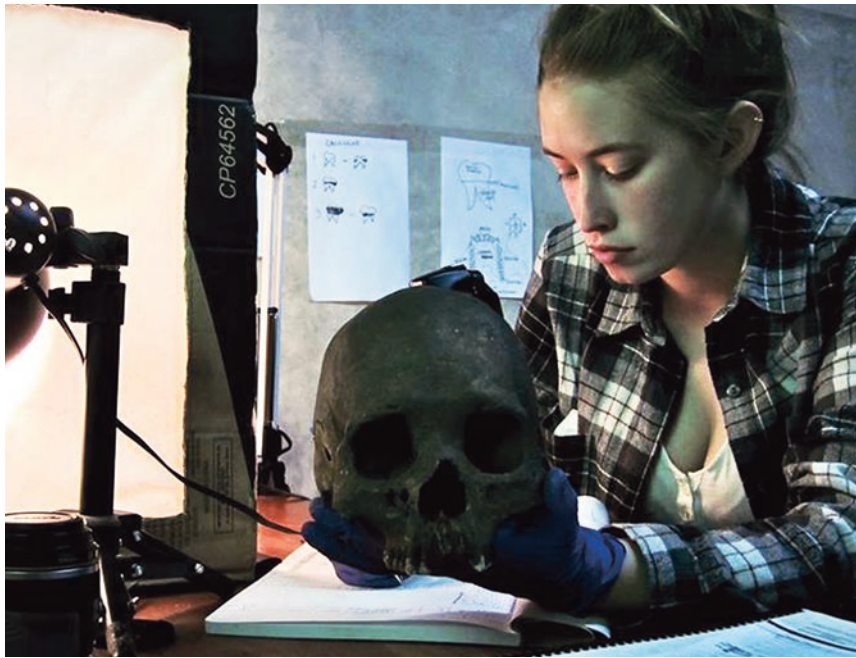


Figure 8. Andi Heile (BA University of Wisconsin–Madison) prepares a cranium for photography. Skulls are photographed, digitized, and cast before minute samples of tooth and bone are sectioned and prepared for biogeochemical processing.

Enmanuel Gomez, Sabine Hyland, Stella Nair, Charles Stanish, and Willeke Wendrich. I am grateful to Annabelle and Philip Lindy, Paulene Popek, Kit and Dick Schmoker, and Bev and Joe Yaeger for their generous energy and support.

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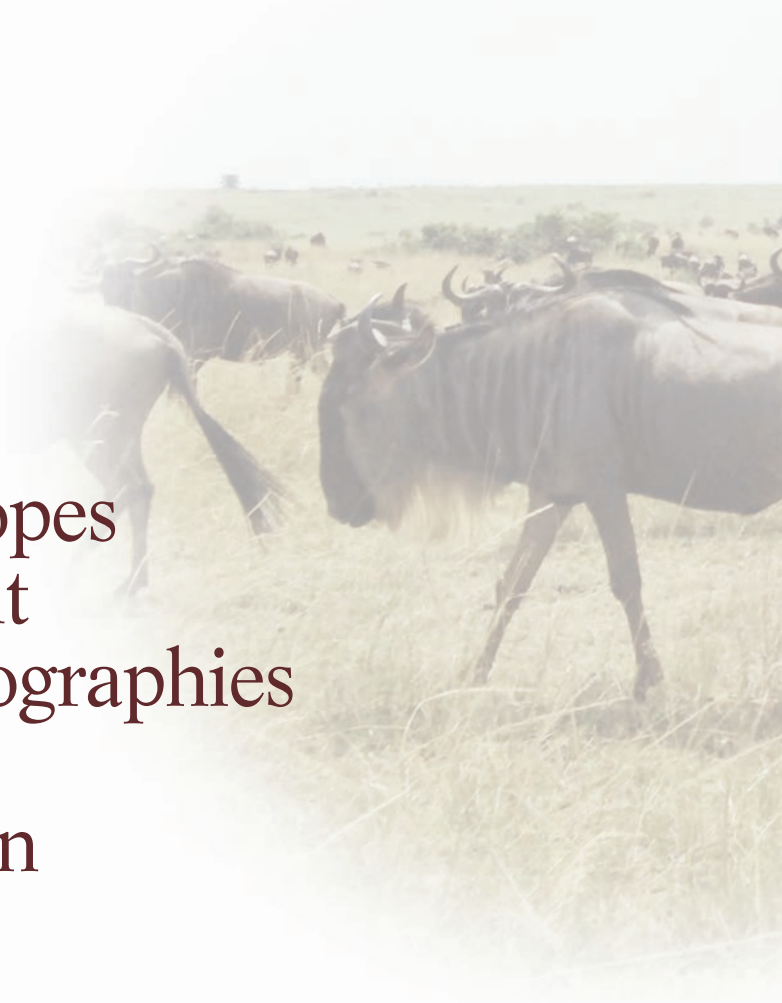
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# Using Stable Isotopes to Explore Ancient Wildebeest Biogeographies in the Context of Pastoral Expansion

Anneke Janzen

RECENT RESEARCH HAS DOCUMENTED the impacts of food-producing economies on wildlife populations in East Africa (Serneels and Lambin 2001). Archaeological evidence testifies to the presence of pastoral populations in south-central Kenya since 3000 B.P., indicating a long history of interaction between local wild species; domesticated cattle, sheep, and goats; and the people who herd them. My postdoctoral research at the Cotsen Institute of Archaeology examines how wildlife populations were affected by the spread of pastoralism in East Africa. Specifically, I focus on shifts in central Kenyan wildebeest migrations and patterns of local extinction in the context of pastoral expansion in Kenya.

Pastoralism developed in northern Africa around 8,000 years ago and gradually spread throughout the continent over the next several millennia. As the climate became increasingly arid in the Sahara, pastoralists with domesticated cattle, sheep, and goats moved south, appearing in the Lake Turkana basin in Kenya in approximately 4500 B.P. (Barthelme 1985; Marshall et al. 1984). The archaeological record, how-



I focus on shifts in Kenyan wildebeest migrations and local extinctions.

ever, documents a significant lag in the appearance of domestic animals in Kenya south of the Lake Turkana basin, with only sparse evidence for caprines in the Central Rift Valley around 4000 B.P. and fully pastoralist sites appearing nearly 1,000 years later (Marean 1992) (Figure 1).

The movement of pastoralism into the Central Rift Valley (Kenya) between 4500 and 3000 B.P. may have been stymied by novel diseases endemic to East Africa (Gifford-Gonzalez 2000, 2016). Mortal diseases carried by wild species native to savanna grasslands south of the Lake Turkana basin would have been encountered by incoming pastoral populations for the first time and would have kept herd populations low, especially in the case of cattle. The decimation of livestock herds from disease may thus have prompted pastoralists to integrate with local foragers. Wildebeest present one such disease challenge (Figure 2).



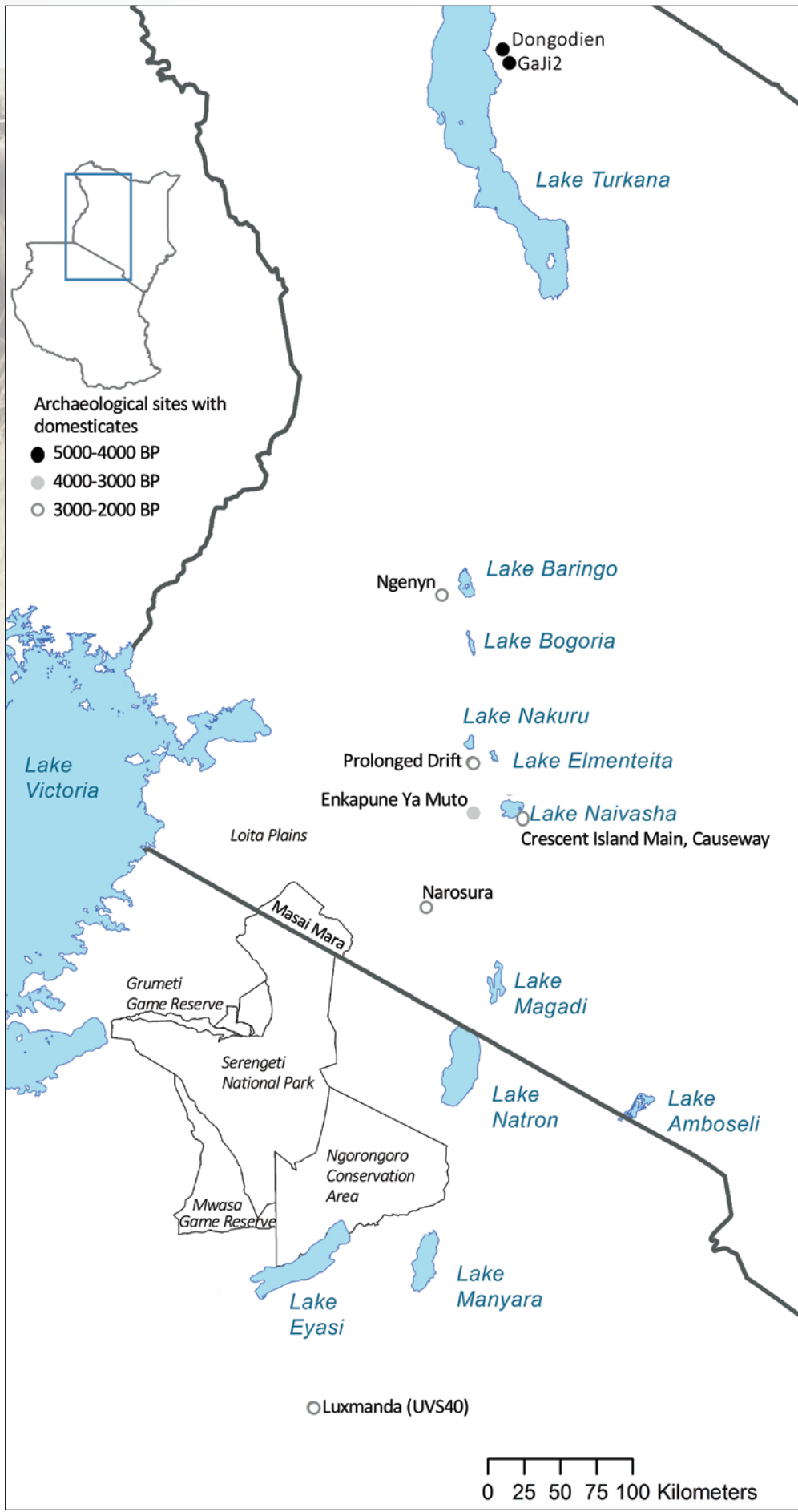


Figure 1. Map of the study area, showing the relevant archaeological sites with domestic animals. The current migratory wildebeest range is indicated by protected areas.

Neonatal wildebeest communicate wildebeest-derived malignant catarrhal fever (WD-MCF), acquiring the disease in utero. Aerosols produced by the calves and amniotic fluids on calving grounds are considered the mode of transmission. Nearly all cattle that contract the disease die (Plowright 1965). Pastoralists understand the etiology of WD-MCF and cope by keeping wildebeest, especially pregnant females, away from cattle grazing grounds and avoid herding cattle in areas where wildebeest calve (Gifford-Gonzalez 2000; Homewood and Rodgers 1984; Jacobs 1965; author’s personal observation).

Today, East African wildebeest (*Connochaetes taurinus*) have a well-known annual migration pattern within protected areas, from the southern Serengeti Plains in Tanzania to the Mara and to a lesser extent the Athi-Kapiti Plains in Kenya. Several resident populations also exist, including in the Loita Plains and the Ngorongoro Conservation Area (Serneels and Lambin 2001). While wildebeest are currently not found north of these parts of Kenya, nor did early explorers describe them elsewhere (Percival 1924), archaeological sites document their presence as far north as Lake Baringo until the second millennium B.P. (Gifford et al. 1980; Gifford-Gonzalez and Kimengich 1984; Hivernel 1983). These sites clearly show the exploitation of wildebeest in antiquity (Figure 3).

Given the significant threats posed by wildebeest to herders, pastoral extirpation of wildebeest populations from prime grazing areas of the Central Rift Valley is one likely cause of their shifting biogeography over time. Stable isotope analysis can inform on

the migrations and life histories of ancient wildebeest. Sampling enamel sequentially along the growth axis of high-crowned teeth can reveal the cyclic seasonal pattern in oxygen isotope values (Fricke and O’Neil 1996), which indicates the seasonality of migrations and birth (Balasse et al. 2003). Strontium isotope ratios track animal migrations across geologically variable substrates (Figure 4). Local strontium isotope signatures are identified by measuring the  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios of animals with restricted home ranges, which average the local bioavailable strontium signature. The relatively young volcanic rocks that form the Central Rift Valley have lower strontium isotope ratios than the much older basement rocks (Bell and Dodson 1981; Janzen 2015).

In my research I use stable isotope analysis to explore wildebeest migration patterns in the context of pastoral expansion. Through sampling wildebeest molars from archaeological sites along the Central Rift Valley, a history of their annual migration cycle may be elucidated. Tooth enamel samples from modern wildebeest were collected in 2014 and provide a reference

These sites show the exploitation of wildebeest in antiquity.



Figure 2. Wildebeest in Masai Mara during the northward July migration in 2014.



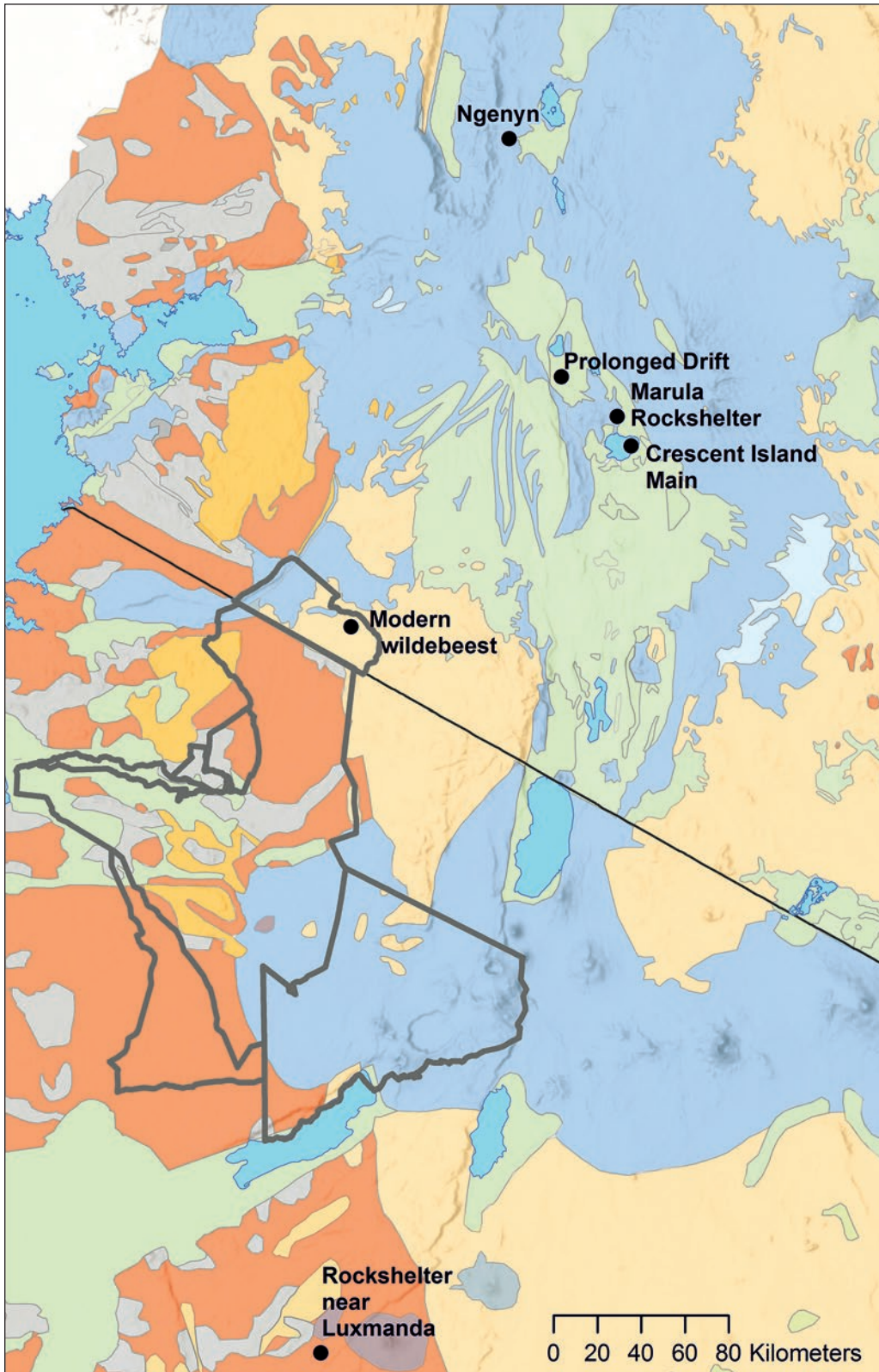
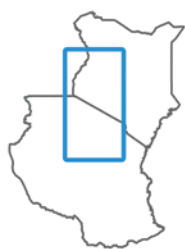


Figure 3. Geologic map of the study area, indicating archaeological sites with sampled wildebeest remains and the current range of migratory wildebeest.



- Sample Sites
- ▭ Protected Areas
- Quaternary Sediments
- Tertiary Volcanics
- Kadirondian
- Tertiary Sediments
- Quaternary Volcanics
- Basement
- Bukoban
- Granite
- Nyanzian
- Lakes

point to which to compare archaeological samples. Because neonate wildebeest, as active carriers of WD-MCF, are a serious threat to cattle, the oxygen and strontium stable isotope composition of enamel will show where wildebeest were calving in antiquity and therefore will determine areas of their greatest danger to pastoral populations moving into their native range. The presence of neonatal remains at some Rift Valley archaeological sites (Gifford-Gonzalez and Kimen-gich 1984) already indicates that wildebeest calving grounds were situated farther north than they are today. My research project also explores whether the ancient wildebeest population of the northern reaches of the Central Rift Valley was resident or migratory. Identifying the mobility patterns of the wildebeest will clarify whether this was a local extinction or a shift

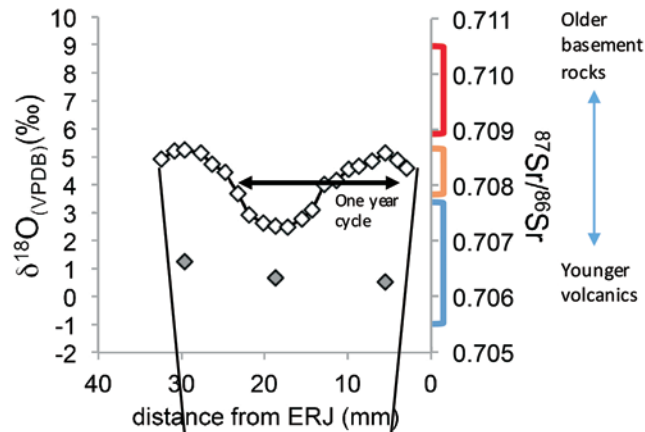
in migration ranges. By analyzing wildebeest remains from sites that span the Holocene, it may be possible to detect gradual shifts in mobility as herding took hold in the Central Rift (Table 1).

This project also ties in to questions of pastoral exchange relationships, as isotopic data from livestock from early pastoralist sites show limited mobility across different geologies, particularly in the Central Rift Valley (Janzen 2015). In instances of local disasters, such as disease outbreaks, herders may activate stock loan or gift friendships to rebuild herds or may resort to raiding (Dahl and Hjort 1976; Spencer 1965; Waller and Sobania 1994). It is possible that exchange relationships on the local scale may have been sufficient for herders to cope with periodic livestock losses due to diseases such as WD-MCF. Stable isotope analysis is thus a powerful tool for assessing anthropogenic effects on wildlife populations. This research will contribute to studies of rangeland ecology and management, and in particular this project will inform future studies of how pastoral land use may have affected wildlife distributions over time.

## Mobility patterns will clarify whether this was a local extinction.

Seasonal variation in  $\delta^{18}\text{O}$  in drinking water and plants due to changes in aridity is reflected in enamel  $\delta^{18}\text{O}$  values.

Dry Season  
Wet Season



Seasonal mobility across differing geologic substrates is reflected in  $^{87}\text{Sr}/^{86}\text{Sr}$  values.

Occlusal portion formed first, earlier in animal's life

Root portion formed more recently, later in animal's life

Figure 4. Example of an individual plot of  $^{87}\text{Sr}/^{86}\text{Sr}$  and  $\delta^{18}\text{O}$  values against distance from enamel-root junction (ERJ) as indicated with a cartoon of a sampled specimen. Differences in  $^{87}\text{Sr}/^{86}\text{Sr}$  and  $\delta^{18}\text{O}$  values are explained in the insets. The  $^{87}\text{Sr}/^{86}\text{Sr}$  axis shows three colors, each representing strontium isotope values for different regions within the study area. The blue, orange, and red markers on the strontium axis indicate  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios for the Central Rift, Masai Mara, and east shore of Lake Victoria, respectively.



Table 1. Overview of the Archaeological Sites from Which Wildebeest Remains Are Sampled.

SITE	LOCATION	DATES (YEARS B.P.)	FAUNA
Prolonged Drift	Open site, floodplain of Nderit River, southwest of Lake Nakuru, Central Rift	2530 ± 160 uncal. B.P. 2590 ± 183 cal. B.P.	Wild and domestic
Ngenyn	Stratified open site in western Lake Baringo basin	1970 ± 150 B.P. and 2080 ± 110 uncal. B.P. 1936 ± 183 and 2085 ± 148 cal. B.P.	Wild and domestic
Crescent Island Main	Open site, Lake Naivasha, Central Rift	2405 ± 150, 2660 ± 120, 2535 ± 140, and 2795 ± 155 cal. B.P.	Mostly domestic
Marula Rockshelter	Base of Mount Eburru, facing Lake Naivasha	7195 ± 260 uncal. B.P. 8032 ± 250 cal. B.P.	Wild
Daumboy Rockshelter 3	Mbulu Plateau	~ 4000 B.P.	Wild

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# A Short Note on Radiocarbon ( $^{14}\text{C}$ ) Dating: Principles, Calibration, and Historical Connections with the University of California

Brian N. Damiata

OCCASIONALLY AN EVENT or development within a discipline profoundly impacts and forever alters its course of study. For archaeology, the advent of radiocarbon dating transformed the field by providing a worldwide chronometric scale that could be used to date and directly compare world cultures (Renfrew and Bahn 2007; Taylor 2009). With the “radiocarbon revolution” (Renfrew 1974), relative sequences from archaeological sites could now be placed in an absolute timescale to enable more meaningful comparative analysis. Key transitions in prehistory, such as the beginnings of the Holocene, Neolithic, Bronze Age, and Iron Age, could be dated. In this article, the fundamentals of radiocarbon dating are reviewed. In addition, the University of California’s historical role in radiocarbon research is briefly discussed.

## FUNDAMENTALS

Earth’s gaseous atmosphere consists of air, which is composed primarily of nitrogen (N) and oxygen (O) atoms but also includes minor amounts of other gases, such as carbon dioxide ( $\text{CO}_2$ ; 0.04 percent). The constituent carbon isotopes in  $\text{CO}_2$  are overwhelmingly of the stable forms  $^{12}\text{C}$  (98.89 percent) and  $^{13}\text{C}$  (1.11 percent), where the superscripts and subscripts denote the atomic masses (neutrons plus protons) and atomic numbers (protons), respectively.

Any organic material that obtains its carbon through photosynthesis can be dated.

However, a very tiny percentage ( $< 10^{-10}$  percent) consists of unstable radiocarbon ( $^{14}\text{C}$  or simply  $^{14}\text{C}$ ), which is mainly generated in the atmosphere by the interaction of cosmic-ray-produced neutrons with  $^{14}\text{N}$ , as schematically illustrated in Figure 1 (Libby 1952; Kamen 1963; Trumbore 2000). The  $^{14}\text{C}$  subsequently reverts back to  $^{14}\text{N}$  by  $\beta$ -decay emission with a half-life of approximately 5,730 years (Godwin 1962). This is the time it takes for a given quantity of radioactive material to decay to one-half of its original content.

The underlying premise of radiocarbon dating is that all living organisms acquire the same ambient  $^{14}\text{C}$  content present in the carbon reservoir where they reside—the atmosphere for terrestrial organisms and the oceans for marine organisms. In the former case, plants take in  $\text{CO}_2$  through photosynthesis. An animal obtains its  $^{14}\text{C}$  when it consumes plants or other animals that feed on plants. The  $^{14}\text{C}$  in plants and animals



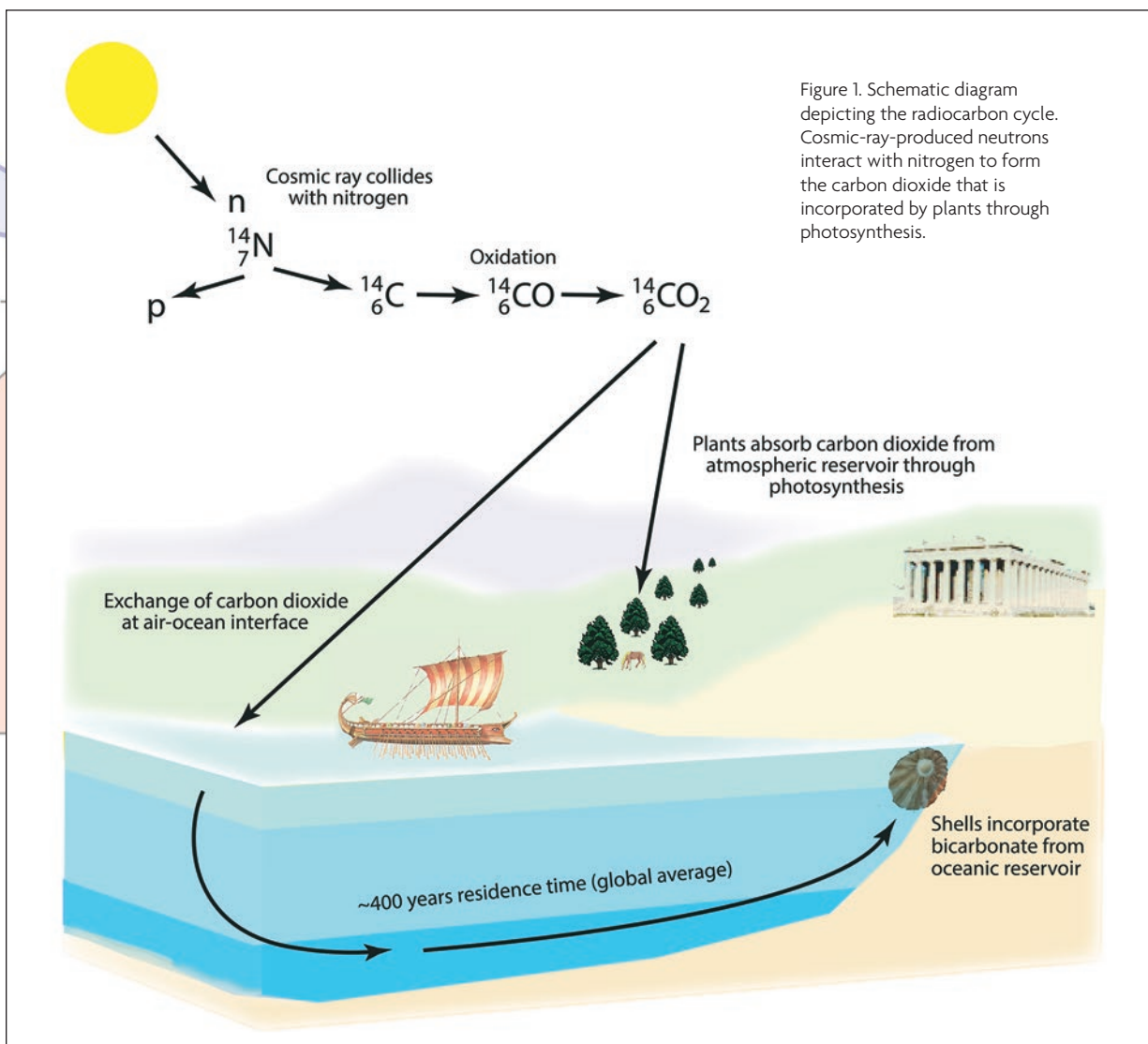


Figure 1. Schematic diagram depicting the radiocarbon cycle. Cosmic-ray-produced neutrons interact with nitrogen to form the carbon dioxide that is incorporated by plants through photosynthesis.

is no longer replenished after death but instead diminishes exponentially with time via radioactive decay. This predictable decrease in  $^{14}\text{C}$  content, as expressed by the ratio of  $^{14}\text{C}$  to  $^{12}\text{C}$ , can be used to determine the elapsed time since death.

As for the oceans,  $^{14}\text{C}$  content is obtained by exchange with the atmospheric reservoir at the air-ocean interface. Marine organisms obtain their  $^{14}\text{C}$  from marine or terrestrial plants and by incorporating bicarbonate into their structures. However, there is a finite residence time, approximately 440 years on average, between when radiocarbon enters the reservoir and its uptake by organisms because of deep global circulation. Thus two contemporaneous samples, one of terrestrial origin and the other marine, will typically yield different radiocarbon ages with the latter being older.

To be datable, samples need to be younger than 55,000 years but older than 300 years (Trumbore 2000). The upper (older) limit is due to the practical limitations of measurement given the reduction in  $^{14}\text{C}$  content after numerous half-lives. At low levels,

even tiny amounts of modern contaminants, such as carbon obtained from the soil, significantly affect the results. The lower (younger) limit—essentially dealing with the time period A.D. 1650 to 1950—is difficult to date because of a plateau in the radiocarbon calibration curve. However, there are two caveats to dating younger samples. First, in some cases it may be possible to obtain an age through wiggle matching, a procedure by which many dates are obtained in a well-defined stratigraphic sequence and then matched to slight variations in the calibration curve. Second, the time period from 1955 to present is datable to within a few years because of the introduction of radiocarbon into the atmosphere from thermonuclear weapons tests, which produced a large measurable spike in  $^{14}\text{C}$  content.

#### METHODOLOGY

Since the beginnings of radiocarbon dating, three generations of instrumentation have been developed to measure the  $^{14}\text{C}$  content in a sample. In the late 1940s, a specially designed Geiger-Müller detector

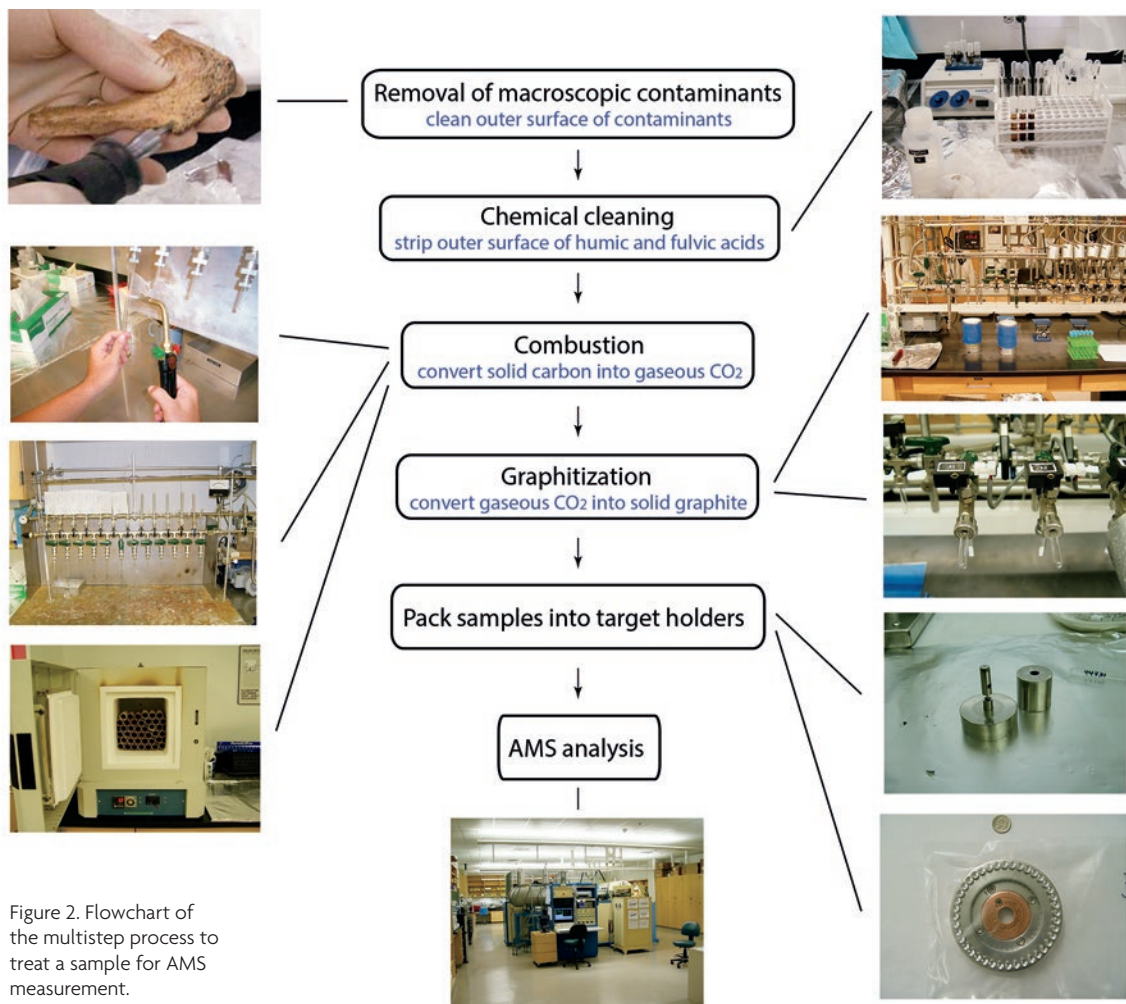


Figure 2. Flowchart of the multistep process to treat a sample for AMS measurement.

was used, but it was rendered inaccurate during the 1950s with the introduction of bomb radiocarbon (Libby 1952; Taylor 2009). The next generation was based on counting individual  $\beta$ -decay emissions by either gas-proportional counters or liquid scintillation. These instruments required samples with several grams of carbon and relatively long counting times of several days to yield statistically meaningful results. In 1977 accelerator mass spectrometry (AMS) was developed; it could measure individual ions of  $^{12}\text{C}$ ,  $^{13}\text{C}$ , and  $^{14}\text{C}$  in a sample. AMS measurements are now routinely performed on samples with approximately 2 mg of carbon—about the size of a pencil point—but amounts can be as low as about 0.02 mg (Santos et al. 2007). In addition, AMS requires much less time for measurement while yielding higher precision.

Essentially any organic material that obtains its carbon through photosynthesis, or by incorporation of bicarbonate in the marine case, can be dated by the radiocarbon method. This material includes but is not limited to charcoal, wood, leaves, seeds, pollen, shell, bone, teeth, papyri, resin, antler, horn, and hair. In general, a multistep process is used to treat samples, as generically depicted in Figure 2. These steps include removal of macroscopic contaminants, chemical

cleaning to isolate the carbon, combustion to turn the carbon into a gaseous form, and then graphitization to reconvert it into a solid—but as graphite, which is the form required for AMS measurement.

The specific protocol for treatment depends on the type of sample. Most archaeological samples are pieces of charcoal or wood. These are treated using an acid-base-acid protocol involving repeated rinses of acidic (HCl) and basic (NaOH) solutions to remove humic and fulvic acids that may have accumulated in a sample after its deposition (Olsson 1986). If these acids are not removed, the radiocarbon measurement could be biased towards a more recent age. Once the sample has been chemically cleansed, it is placed in a quartz tube with bits of cupric oxide to provide an oxygen source, plus silver wire to “getter” any impurities that may adversely impact the graphitization process. The tube is then sealed under vacuum using a gas torch and combusted in a furnace at 900°C for three hours, which converts the sample into CO<sub>2</sub> gas. The tube is then placed on a vacuum line, and the gaseous sample is cryogenically moved to a vial containing an iron-powder catalyst. The sample is converted into solid graphite via a hydrogen-reduction chemical reaction



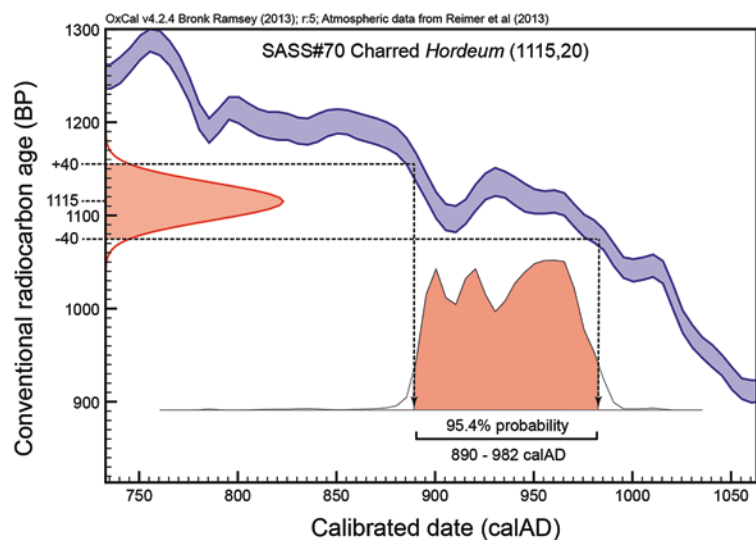


Figure 3. Example of the calibration of a radiocarbon measurement based on Bayesian statistical analysis using OxCal software (Bronk Ramsey 2001, 2009; Bronk Ramsey and Lee 2013).

The radiocarbon calibration curve has been established by measuring the  $^{14}\text{C}$  content in independently dated materials.

that occurs by heating to 500°C for several hours. Lastly, the sample is packed into an aluminum pellet for measurement by the AMS spectrometer.

The result of radiocarbon measurement is presented as “conventional radiocarbon age BP” with a unit of  $^{14}\text{C}$  years. BP stands for “before present,” which by convention is the year 1950 (Stuiver and Polach 1977). By using 1950, one does not need to consider what year the measurement was made. However, a radiocarbon year does not equate directly to a calendrical (absolute) year for two reasons. First, atmospheric  $^{14}\text{C}$  content varies with time due to temporal variations in cosmic-ray, solar, and geomagnetic activities and, to a lesser extent, the emission of  $\text{CO}_2$  from volcanoes and oceans (de Vries 1958; Suess 1965; Trumbore 2000). Second, radiocarbon laboratories mutually agreed to assume an incorrect value of 5,568 years for the half-life of  $^{14}\text{C}$ —the value first determined with development of radiocarbon dating in the 1940s but since revised to 5,730 years (Engelkemeir et al. 1949; Godwin 1962)—to be consistent with previously published determinations (Stuiver and Pollach 1977; Trumbore 2000). It was also decided that the underlying inaccuracies would be rectified through the process of calibration, which aims to convert conventional radiocarbon ages to calendrical dates.

The conventional radiocarbon age takes into account any fractionation of carbon isotopes that may have occurred while the organism was alive, or during the actual AMS procedure. Fractionation occurs when the ratio of  $^{14}\text{C}$  to  $^{13}\text{C}$  or  $^{12}\text{C}$  in the organic carbon that plants take up by photosynthesis differs from atmospheric  $\text{CO}_2$  because of physical or chemical processes

(Trumbore 2000). Any discrepancy is normalized to standard values as part of the AMS procedure.

## CALIBRATION

The radiocarbon calibration curve has been established by measuring the  $^{14}\text{C}$  content in independently dated materials, including tree rings, plant macrofossils, corals, speleothems, and foraminifera (Reimer et al. 2013). Tree rings constitute the primary source of calibration from the present to about 14,000 BP. Trees grow by adding an annual layer of cellulose to the circumferences of their trunks with previous growth no longer incorporating  $^{14}\text{C}$  but subject to radioactive decay. The thickness of the annual layer will vary depending on environmental factors such as the amount of rainfall during growth. Because all trees in a region are similarly affected, individual pieces of old wood will have overlapping sequences that can be matched by the relative thickness of rings to yield longer-term sequences. In a piecewise manner, a long-term dendrochronology has been established. Other data sets—such as the  $^{14}\text{C}$  content of organic material in varved sediments from glacial lakes and of corals and speleothems that have been independently dated by uranium-series analysis—allow the calibration curve to extend to about 55,000 BP.

Figure 3 graphically illustrates the calibration of a radiocarbon measurement. In the graph, the  $x$  and  $y$  axes represent calendrical date and conventional radiocarbon age, respectively, and the calibration

curve for the time interval is depicted in blue. For this example, the sample was a charred barley seed from a Viking-age site in northern Iceland. The AMS measurement yielded a conventional radiocarbon age of A.D. 1115  $\pm$  20  $^{14}\text{C}$  years BP, where the uncertainty is the measurement error at one standard deviation ( $\pm 1\sigma$ , 68.3 percent). This age is depicted as the normal distribution as shown in red along the y axis. The intersection of this distribution with the calibration curve yields a range in calendrical dates. Note that although a  $\pm 1\sigma$  error is assigned to the radiocarbon measurement, it is common practice to assume  $\pm 2\sigma$  (95.4 percent) for the purposes of calibration. For the present case, calibration was performed by Bayesian analysis (Bronk Ramsey 2001, 2009; Bronk Ramsey and Lee 2013), which yielded a calibrated range—more formerly the highest posterior density range—of 890 to 982 cal. A.D.

Complicating factors or nuanced issues may need to be considered for calibration. For example, there are slight differences in global atmospheric  $^{14}\text{C}$  contents in the northern and southern hemispheres, necessitating the use of different calibration curves for samples from these regions. Similarly, as previously noted, there is a lag time for carbon that resides in the marine reservoir to be incorporated into marine organisms. A marine calibration curve is normally applied to marine samples, which requires knowledge of the local deviation—referred to as the local reservoir effect—from the globally assumed value. For the dating of skeletal remains where the animal had a mixed terrestrial–marine diet, assumptions on the percent contribution from each source will be needed, and accordingly a combination of the terrestrial and marine calibration curves is applied. Other issues, such as the dating of long-lived species, may need to be considered when interpreting results.

#### HISTORICAL CONNECTIONS WITH THE UNIVERSITY OF CALIFORNIA

Researchers from various University of California campuses and affiliated laboratories have been at the forefront of radiocarbon research from its inception nearly 80 years ago to the present. In the 1930s, researchers working on nuclear reactions at the Radiation Laboratory at UC Berkeley laid the foundation for radiocarbon dating. Franz Kurie, Sam Rubín, and Marten Kamen, among others, were involved in the discovery of  $^{14}\text{C}$  (Kurie 1934; Kamen 1963), but noting that such a “discovery is seldom a single event that can be attributed wholly to a particular individual, time or place” (Kuhn 1962).

During the 1940s, Willard Libby, formerly at the Radiation Laboratory, and his coworkers Ernest Anderson and James Arnold at the University of Chicago made the first measurements of  $^{14}\text{C}$  in nature. Later they demonstrated the viability of the radiocarbon method by dating wood of known age, which included samples from the tombs of the Egyptian kings Zoser and Sneferu (Arnold and Libby 1949; Libby et al. 1949). In 1959, Libby became the director of the Institute of Geophysics and Planetary Physics at UCLA, where he also established the Isotope Laboratory to conduct radiocarbon research (Taylor 2014). For his pioneering work in developing radiocarbon dating, Libby was awarded the Nobel Prize in Chemistry in 1960.

Hans Suess joined the Scripps Institute of Oceanography in 1955 and soon thereafter became one of the four founding faculty members of UC San Diego. Suess headed the Soledad Laboratory, which was dedicated to studying the distribution of radiocarbon and tritium in the oceans and atmosphere. In 1967 he produced the first radiocarbon calibration curve; it was based on measuring the  $^{14}\text{C}$  content of tree rings from bristlecone pine trees in California (Suess 1967, 1970). He also studied the dilution of atmospheric radiocarbon due to  $\text{CO}_2$  released from the burning of fossil fuel since the onset of the Industrial Revolution. This fuel is devoid of  $^{14}\text{C}$  due to radioactive decay during long-term underground storage. This dilution is known as the Suess effect (Keeling 1979).

In the early 1970s, R. E. (Erv) Taylor, who worked in Libby’s laboratory as a graduate student, established the Radiocarbon Laboratory at UC Riverside. It was equipped with liquid scintillation counters as well as a graphite line for AMS-based analysis. With his major focus being the earliest peopling of the New World, Taylor has written extensively on the role and history of radiocarbon dating. He has been involved in the dating of many high-profile skeletal remains, such as Kennewick Man and the Ice Maiden. He is currently an emeritus professor at UC Riverside and is also affiliated with the Cotsen Institute.

The Keck Carbon Cycle Accelerator Mass Spectrometry (KCCAMS) facility was established at UC Irvine in 2002 just as the Radiocarbon Laboratory at UC Riverside was closing down. The codirectors are John Southon, Susan Trumbore and Ellen Druffel, a former graduate student of Suess’s. Since its inception, the KCCAMS facility has analyzed nearly 200,000 samples, many for archaeological study. Of only a handful of AMS facilities in the United States, it is one of two currently associated with the University



of California. The other is the Center for Accelerator Mass Spectrometry at Lawrence Livermore National Laboratory, which has been conducting isotopic research for more than 60 years.

### FINAL THOUGHTS

To be sure, the advent of radiocarbon dating has profoundly impacted our study of ancient civilizations. Yet much more is to be learned. Recent studies have identified “time markers” in tree rings that could help further refine dating events (Dee and Pope 2016). Unusually high levels of  $^{14}\text{C}$  have been found in tree rings that formed during intense solar activity. Such spikes, referred to as Miyake events, occurred in A.D. 775 and 994, and others are suspected. These time markers would have been incorporated into every living plant or tree growing at those times and would be present, for example, in timbers used in construction and in artifacts fashioned from plants, such as papyrus and baskets. The potential to date some events that happened thousands of years ago to an exact year may be at hand. Meanwhile, John Southon and the author are presently engaged in a pilot study to determine whether collagen extracted from bones as part of the radiocarbon procedure contains ancient DNA. The radiocarbon revolution is alive and well.

For more detailed discussions on methodology and historical review, the interested reader is referred to the corpus of work by R. E. Taylor.

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## The Life of the Egyptian Coffin: Preliminary Report

*Caroline Arbuckle MacLeod, Elsbeth Geldhof, Marissa Stevens, and Kara Cooney*

ONE OF THE GREATEST benefits of working in the Interdepartmental Program in the Cotsen Institute of Archaeology is the opportunity to work with a diverse group of scholars with a wide range of specialties. This collaboration allows students and professors alike to complete multidisciplinary projects that attempt to tackle research questions from as many angles as possible. Recently, a group of Egyptologists and archaeologists from the Cotsen Institute and the department of Near Eastern Languages and Cultures (NELC) decided to put together a project to come to a richer understanding of the life of the Egyptian coffin. Coffins were one of the most vital components of Egyptian burials and can be found from every era of ancient Egyptian history, from the Early Dynastic period (beginning circa 3100 B.C.E.) to the Roman period (ending circa 640 C.E.). Coffins are social documents. Individuals from many levels of society, and certainly those with disposable income, ensured that their tombs were equipped with coffins. Coffins thus reflect changes in economic resources, religious practices, artistic tastes, and trade. A greater understanding of these objects has the potential to provide broad insight in Egyptian society.

The Life of the Egyptian Coffin Project is closely

Coffins can be found from every era of ancient Egyptian history.

related to Cotsen graduate student Caroline Arbuckle MacLeod's dissertation, in which she explores the steps necessary to create a coffin, as well as Professor Kara Cooney's research on the reuse of coffins from ancient Egypt. The work also involves a visiting expert on pigment sourcing and creation, historic paint conservator Elsbeth Geldhof, and NELC graduate student Marissa Stevens, who specializes in papyri, coffins, and questions related to the identities of their owners. By combining the study of ancient coffins, their construction materials, and painting techniques with scientific analyses of wood, pigments, and varnish, not to mention ethnoarchaeology and experimental archaeology, these experts hope to re-create a coffin using methods available to the ancient Egyptians. Working hands-on with real materials while attempting to replicate ancient techniques allows for a much better understanding of how Egyptian coffins were





Figure 1. Caroline Arbuckle MacLeod introduces the study group to the most common woods used in coffin construction.

created and how the art of coffin making may have changed through time.

In the spring of 2016, Caroline, Kara, and Elsbeth put together a study day to launch the project and to show members and friends of the Cotsen Institute what questions they hoped to answer. The day began with talks, followed by practical sessions in the afternoon. Kara gave a talk about coffin reuse in which she emphasized how important it was for all research to focus on the social aspects of coffin construction while still being grounded in scientific, linguistic, and historical analyses. Caroline then spoke about evidence currently available for the study of the carpentry of Egyptian coffins and the lives, actions, and decisions of woodworkers, showing how ethnographic and experimental methods can greatly deepen our understanding. Next, Ioanna Kakoulli, chair of the Conservation IDP, spoke about the research she carried out on the creation and identification of Egyptian Blue, an anthropogenic pigment often used to decorate coffins, tombs, and much more. Her research expands into the sources necessary to produce Egyptian Blue (such as leaded bronze and calcium-rich sand) and the use of the pigment to modify the hue of paints in Roman times. Finally, Elsbeth Geldhof spoke about the fibers, twigs, and reeds needed to create paintbrushes; pigments and materials used to layer decoration on coffins; and materials used as varnish. She emphasized the extensive gaps in our knowledge about processes that are often taken for

granted. While the talks attempted to express how complex and challenging the creation and decoration of coffins would have been in the ancient world, the message was made all the more apparent when the audience was invited to try some simple woodworking techniques and to mix pigments with ancient binders. While the group of historians, linguists, archaeologists, and conservators had a fantastic time trying out different methods, it was very clear that there is much we still do not understand—from the basic steps of construction and wood modeling to the details of decoration and varnishing.

After the study day, the first few experiments were under way, and plans were put in motion to proceed with the long-term project. Understanding the complete coffin-making process means analyzing wooden materials, woodworking techniques, materials added to change the shape and texture of the finished object, pigments used for decoration, varnish, and how all of these aspects may have been altered throughout the life of the coffin if it was reused and redecorated after its initial interment or if it was placed in a museum display after extensive restoration.

#### LIFE OF THE EGYPTIAN COFFIN STEP 1: TIMBER

In her dissertation, Caroline Arbuckle MacLeod examines the wood the ancient Egyptians used to create coffins and other objects. She looks at the origin of the trees, how timber was brought into Egypt, and the



Figure 2. The study day group works on various stages of coffin decoration—from preparing the wooden boards with plaster layers to the final varnishing of a painted panel.



Figure 3. Elsbeth Geldhof explains methods of producing a workable paint to members of the study day group.



Figure 4. Members of the study day group compare their final artistic masterpieces.

types of wood used by certain groups in society. She is particularly interested in how and why construction techniques and timber choices changed over time.

#### LIFE OF THE EGYPTIAN COFFIN STEP 2: TOOLS

Within the project, Caroline will carry out a number of woodworking experiments, working hands-on with modern carpenters. Using only hand tools similar to those available to the ancient Egyptians, Caroline has so far replicated a number of joint types used to construct coffins. One aspect of coffin construction revealed by these experiments is how frequently the tools would have had to be sharpened. Even modern carbon steel chisels have to be sharpened every few minutes when working with a hardwood similar to acacia or sycomore fig. The bronze and copper tools used in antiquity would have needed even more attention, and Caroline believes that assistants or even slaves, whose sole task was maintaining the tools of their masters, would have been required.

#### LIFE OF THE EGYPTIAN COFFIN STEP 3: WOODWORKING

If we replicate ancient woodworking techniques, the movements of carpenters can be better understood. Caroline is recording modern tool marks to compare them to marks left on ancient coffins. This will allow us to extrapolate which movements and tools may have been used for each coffin, providing a better understanding of the evolution of construction techniques and the different methods used to work with different types of wood. We will also explore whether certain joints or finishing methods were used in different levels of society. The ultimate goal of the project is to re-create a complete coffin, demonstrating each step needed for construction and providing insight into a wide range of craft movements and choices made by woodworkers. The results will be combined with additional experiments relating to pigments and coffin reuse to allow for a complete analysis of the coffin and its social and economic importance.

#### LIFE OF THE EGYPTIAN COFFIN STEP 4: APPLICATION OF PREPARATION LAYERS AND PAINT

For the analysis of pigments and decoration techniques, a number of test planks that replicated elements of authentic decoration were created under Elsbeth's direction and supervision. Challenges included successful artistic paint application, maintaining a decent scribal hand, applying var-





Figure 5. Marissa Stevens writes an inscription on a test board at the Getty Villa conservation labs.

### The audience was to try simple woodworking techniques and to mix pigments with ancient binders.

nish to decorated surfaces before it solidified, and understanding how varnished pieces may have been redecorated, reinscribed, and reused. Elsbeth overcame the challenge of blending artistic image and text by employing several scribes to help her. Regardless of artistic ability, a draftsman who wanted to copy a text onto a coffin would have needed either to be literate or to have the help of a scribe. Being hieroglyph-illiterate herself, Elsbeth utilized the help of Caroline, Marissa, and Cotsen graduate student Vera Rondano to copy texts onto prepared wooden boards. This simple action of reaching out for specialized help provided us with a small glimpse into the types of professional relationships that must have been forged

and sustained between woodworkers, draftsmen, and scribes in formal and informal Egyptian workshops, as well as the possible existence of specialists in varnish application or the production of coffin elements such as ears and hands. Our chosen text was a Twenty-Second Dynasty title and name of an official that all three scribes copied onto a historically accurate prepared orpiment surface. This first writing experiment proved immediately what we already suspected: apart from knowing how to write, a scribe had to be able to handle largely unprocessed materials on a curved, irregular, large-scale, and unforgiving surface.

#### LIFE OF THE EGYPTIAN COFFIN STEP 5: VARNISH

Although we need a lot more experimentation to fully understand how coffin redecoration actually worked, we do know that varnish was an ally to the reuser, covering erasures and reinscriptions and joining different layers of paint into one. Of all the practical hurdles we faced, varnish was the most challenging for simple modern coffin makers like us. The main ingredient of varnish would have been resin from the *Pistacia lentiscus* tree. This resin, or mastic, is a semisolid substance that needs treatment to be brushed onto a coffin surface without it seizing or solidifying. Heating the mastic certainly softens it and turns the hard solid into a sticky, pliable substance that with a bit of imagination could be described as a liquid. We found during testing that the mastic alone solidifies so quickly that one does not have time to properly draw a brush or flat stick across a surface for a smooth application of the product. Heating the surface and continually heating the varnish as it is applied helps tremendously, but our use of a heat gun or hair dryer was, without question, not the process used in ancient times.

While it would seem logical to use some kind of solvent, numerous analyses of ancient varnishes show that no additives were used. We are currently working with a number of hypotheses: Perhaps the overbearing Egyptian sun was utilized to advantage, with the extreme heat of the Theban summer allowing varnish to be applied smoothly, albeit only seasonally. People certainly did not die only in summer, however, so there must have been other solutions. We considered the location of the varnishing. If it was done in an enclosed setting such as a tomb, with fires lit, would the ambient temperature increase sufficiently to allow for easier varnish application? This potential solution caused some argument among us. Finally we decided that we should not overlook the limitations of modern methods for analyzing organic materials such as bind-





Figure 6. A test board with preparation layers, a painted background, a hieroglyphic inscription, and final varnish layers.

ing media and varnishes. The resins in varnishes are highly unstable and are therefore heavily degraded by the time material scientists can do chemical analyses. Alternatively, the solvent could have been derived from the same, or very similar, resins that were used to make the varnish. The chemical signature would then be similar to the ancient varnish and thus undetectable by modern researchers.

#### LIFE OF THE EGYPTIAN COFFIN STEP 6: MODIFICATION AND REUSE

The three versions of the replicated ancient text not only were used to experiment with paint and varnish application but also allowed us to explore different methods for changing the name on a coffin, a popular practice that allowed coffins to be reused by subsequent owners. By trying to replicate the methods used in redecorating and reinscribing coffins, we can better understand not only the technique of the reuse process but also the motivations behind the reuse: What does it mean to erase a name on a particular coffin and add a new one? How did it feel to reappropriate a coffin in a workshop context? Were artisans instructed to keep an old name and add a new name alongside it or elsewhere on the coffin, or is the survival of two

names a remnant of a messy and incomplete reuse process? Perhaps keeping an old name was one means of showing respect for or connection to the previous owner. By attempting reuse on actual wood, preparation layers, pigments, and varnish, we can better understand how these materials either lend themselves to the reuse process or restrict the act of reuse.

Another aspect of coffin reuse is gender modification by the alteration of typical gender markers such as wig decoration, the addition or removal of breasts, the change of hand positions from male (fisted) to female (flat), the removal of earrings, and/or the addition of ears—all gender markers integral to Egyptian anthropoid coffins. We made a start in investigating these processes by forming ears out of mud plaster. If a female coffin with only earlobes showing was reused and changed into a male coffin, ears needed to be added, and it was much easier to add ears of plaster than ears of wood. In our analyses, we found that the plaster was not necessarily made of mud, as often stated. It was more likely a clay-rich material with a brown or gray color made into a moldable substance by adding sand, plant fibers, and other materials. Beforehand, we were skeptical of our abilities to form an ear, but despite being complete novices at clay sculpting, it took us a whole 20 seconds to produce an ear. This was a real eye-opener, and we cannot wait to explore the processes of fashioning human elements for coffin construction or coffin reuse. This will give us more insight into the skills needed for a variety of coffin redecoration methods, ranging from the skillful application of written language or the highly specialized use of tools and materials to the few techniques that even we were capable of doing quite easily.

#### LIFE OF THE EGYPTIAN COFFIN STEP 7: NEW FRONTIERS

Our experiments in coffin making constantly reveal new insights into the construction and decoration of coffins. We hope they will also contribute to new, noninvasive methodologies for analyzing such ancient objects. If we could penetrate the outer surface of decorations and see each underlying layer, the marks on the wood, and the construction elements, we could more confidently explain the steps of construction and the layers of reuse and could provide a more complete biography of each coffin. Conventional techniques such as the stratigraphic investigation of paint cross-sections are conclusive in establishing the paint layering topography of coffins, coffin lids, and mummy boards, but they are also destructive. Furthermore, because of the scale of a paint sample (less than

1 mm<sup>2</sup>), stratigraphic paint analysis will provide accurate information for only a tiny area of a given coffin.

A UCLA Transdisciplinary Seed Grant, in combination with discretionary awards from the dean of humanities, has allowed us to combine our experimental archaeology coffin work with in situ imaging. We are in the process of making conventional visible light observations, analyzing UV-fluorescence and infrared photography, and capturing images with false-color infrared, visible-light induced luminescence, and a digital microscope. In the context of Kara's research into the reuse of coffins, we have thus far concentrated mainly on possible markers of redecoration on a coffin surface in an attempt to understand new paint and varnish layers in relation to previous decoration.

To this end, we are grateful for the assistance of Adrian Tang of the High Speed Electronics Laboratory (UCLA) and a project leader at the Jet Propulsion Laboratory (NASA), who specializes in microwave spectroscopy and radiometry. Together with Remy Hiramoto, a microelectronics engineering specialist and Egyptology enthusiast, we are able to apply space mission experience to the research of redecoration processes of ancient Egyptian mummy coffins. Adrian is applying terahertz analysis techniques and infrared measurements to test boards with single pigment layers, as well as historically informed paint layering. Infrared, wavelengths just above visible red, and terahertz, with wavelengths between infrared and microwave, have the ability to penetrate a surface layer and are therefore possible vehicles to observe the behavior of layers located under the surface. The infrared measurements test the thermodynamic behavior of the paint materials as well as the substrate—which can be wood or textile—and their location in the stratigraphy. Terahertz analysis has been tried in the reflective mode as well as the time domain, the latter based on the time a paint layer takes to absorb, scatter, and reflect the signal.

These techniques, designed by Adrian specifically for NASA's space missions to Jupiter and its moon Europa, have never been tried in another context. This fortunate and exciting collaboration introduces a host of new challenges. For instance, the irregular paint layers on a typical Egyptian coffin, which often do not exceed a thickness of a few microns, are not exactly comparable to the oceans of unknown matter on planets millions of miles away. While Egyptian coffins and the solar system are different foci of analysis, the journey to identify the unknown by means of methodological observation is the same. As with the experimental archaeology tests, we address this from a

tabula rasa perspective: we are observing and learning how the materials behave without worrying too much about the extremely limited availability of these advanced, hypersensitive techniques.

The coffins from ancient Egypt have the potential to reveal a remarkable amount of information about ancient society, if only we can access the information. Although the Life of the Egyptian Coffin Project is still in its infancy, we have already made a number of exciting discoveries about construction and decoration techniques, and we have come up with a multitude of questions for future exploration. After all, we still have to build our coffin. In addition to the information we are uncovering about ancient society, we are also working on new methods for the scientific analysis of decorated wooden objects, ranging from simple observations about paint application and tool marks to complicated tests in layering and stratigraphy done with tools currently used for space exploration. It is remarkable what can be accomplished when a diverse range of experts with a common interest get together. It is the type of exhilarating research that can be accomplished in places like the Cotsen Institute of Archaeology, where multidisciplinary approaches are possible, encouraged, and celebrated.



Figure 7. Elsbeth Geldhof molds a human ear out of mud plaster in an attempt to replicate the detail of a face on a coffin lid.



## UCLA Team “Rocks” at Preah Khan of Kompong Svay, Cambodia

*Ellen Hsieh, Tom McClintock, and Christian Fischer*

PREAH KHAN OF KOMPONG SVAY, also known as Bakan, is one of the largest and most mysterious temple complexes of the Angkorian Khmer Empire period (ninth–fifteenth century C.E.). Located in the middle of the jungle, about 100 km east of the ancient capital of Angkor, Bakan was built in different phases between the late tenth and the early thirteenth century. It contains four concentric wall systems that enclose an area of roughly 22 km<sup>2</sup>, including half of a *baray*, or large artificial lake. Although French explorers documented Bakan in the late nineteenth century, scholars and the Cambodian government paid more attention to the temples of the Angkor area. Similar to other sites, research on Bakan mainly focused on masonry history based on epigraphic sources (Clark 2007; Coedès 1968; Stern 1965). Archaeological inquiry has been limited (Mauger 1939; Pottier 2000), and Bakan remains poorly understood despite its importance, notably for our understanding of metallurgical activi-

The TBT project focuses on the development of Buddhism through a multidisciplinary approach.

ties (Hendrickson et al. 2013). In the turmoil that followed the tragic Khmer Rouge period, the site was massively looted, with irremediable effects on both architectural and archaeological records.

Launched in 2015, the Two Buddhist Towers of Preah Khan project (TBT) focuses on the development of Buddhism in Bakan between the tenth and sixteenth centuries and related changes in the rituals and daily lives of the population. The project investigates both archaeological evidence and the materiality of the temple complex. Of particular significance is the transition from Mahāyāna to Theravāda Buddhism, exemplified by the construction of the Preah Thkol and Preah Chatumukh towers. TBT is a collaborative





Figure 1. The TBT project team in front of the west *gopura* (entrance gate) of the third enclosure of Bakan during the 2016 field season.

project involving a multidisciplinary team of scholars from various institutions, including the University of Illinois–Chicago, UCLA, l'École française d'Extrême-Orient, Mahidol University, the Royal Academy of Cambodia, and University College London (Figure 1). With the help and guidance of Christian Fischer, one of the project directors, two Cotsen Institute students, Ellen Hsieh from the Archaeology Program and Tom McClintock from the UCLA/Getty Conservation Program, were able to participate in the fieldwork.

The team was based in Ta Seng, a village adjacent to the fourth enclosure, on the southeastern side of the complex. Because Bakan has not yet become a popular tourist destination, Ta Seng fortunately still has a feeling of authenticity, long ago lost in other, more crowded places. We stayed at the house of the chief of the village, who converted part of it into a guesthouse. Eating could have been a challenge, as there is only one small restaurant in the village. Luckily, we arranged for the chief's wife and family to cook for us twice a day. Meals consisted of rice with meat or fish, with various kinds of vegetables and fruits. Although basic, the food was always plentiful and savory; grilled deer, rabbit, and wild pig were sometimes welcome surprises. Ta Seng was mainly deserted during the day, with many people working in the rice fields, but most

nights it was transformed into a vivid place. Khmer-style electronic music was blasted through powerful speakers from around 9 p.m. to sometimes 2 a.m., indicating an ongoing wedding or other ceremonies. Sleeping times could be rather short, especially when monotonous prayers broadcast from the pagoda woke us far too early. Often the only quiet moment was during breakfast, before the crew headed to Bakan for another exciting and productive day.

Known as the UCLA Team, a name given by one of the project directors, Mitch Hendrickson, who was impressed by our multifaceted work and expertise, we mainly focused on the materiality of the stone temples, in particular the “rocks” (Figure 2). A huge number of sandstone blocks were used to build Bakan. Some were impressively large and weighed several metric tons, which led us to assume that they had been quarried nearby. Previous investigations, however, were unsuccessful at finding outcrops of matching lithology, and the provenance of these large volumes of sandstone remains an important but unsolved problem. One of our goals was therefore to investigate potential sandstone sources by combining geological survey with archaeometric approaches. Besides the identification of the sandstone type used for Preah Thkol and Preah Chatumukh, we also studied other architectural





Figure 2. The UCLA Team in action.



Figure 3. Sandstone compositional analysis with portable X-ray fluorescence in the first enclosure, “supervised” by a group of kids from Ta Seng.

## We mainly focused on the materiality of the stone temples.

structures of the Bakan complex, as well as various stone artifacts found on the site and in the excavations. Using noninvasive technologies—a handheld X-ray fluorescence analyzer and a portable fiber optics reflectance spectrometer operating in the visible and the near infrared—we were able to collect much compositional data for further study (Figures 3 and 4).

We also carried out several geological surveys in the area around Bakan, keeping in mind that in Cambodia, the top risks for any kind of field survey are not the potential dangers of the tropical jungle but rather the millions of remaining land mines. One golden rule, therefore, is to never stray too far from the pathways—obviously a serious limitation for the type of research we were conducting. Nevertheless, at the end of the second season, we found a potential source for the fine-grained sandstone used for many of the small stone artifacts in a riverbed a few kilometers southeast of Ta Seng. The source of the sandstone used for the main architecture has yet to be found, but a reasonable assumption is that it was quarried somewhere in the *baray*, today partially filled with sediments. Field analysis was complemented by the collection of a set of sandstone samples for a more in-depth study in the laboratory, using techniques such as thin-section petrography, scanning electron microscopy combined with energy-dispersive X-ray spectroscopy, Raman





Figure 4. Remote spectral data collection at Preah Chatumukh with fiber optics reflectance spectroscopy.

spectroscopy, and laser-ablation inductively coupled mass spectrometry.

Another aspect of our research was the study of lintels with five niches in the first and second enclosures of the temple complex. It is believed that the five seated Buddhas now depicted in the lintels are the result of a modification of the original design related to the change in Buddhism that occurred at Bakan. To investigate the recarving process, we documented the lintels systematically in several hundred photographs. These pictures were used to create three-dimensional models—using structure-from-motion software—to enable precise comparative analysis of the original and recarved Buddha lintels (Figure 5). Features inaccessible from ground level were documented with *Bakan One*, a Phantom 3 Pro drone (DJI) and one of the first unmanned aerial vehicles used in Cambodian archaeology (Figure 6). We are proud to say that the drone worked well, even after two crashes. In addition, *Bakan One* collected data for the modeling of a single tower in an attempt to estimate the amount of sandstone used for its construction. Thorough investigations also allowed us to spot remnants of

We found a potential source for the used sandstone.



Figure 5. Three-dimensional model of one of the lintels in the north *gopura* of the first enclosure of Bakan.





Figure 6. Using *Bakan One* to take a closer look at the upper parts of Preah Thkol.

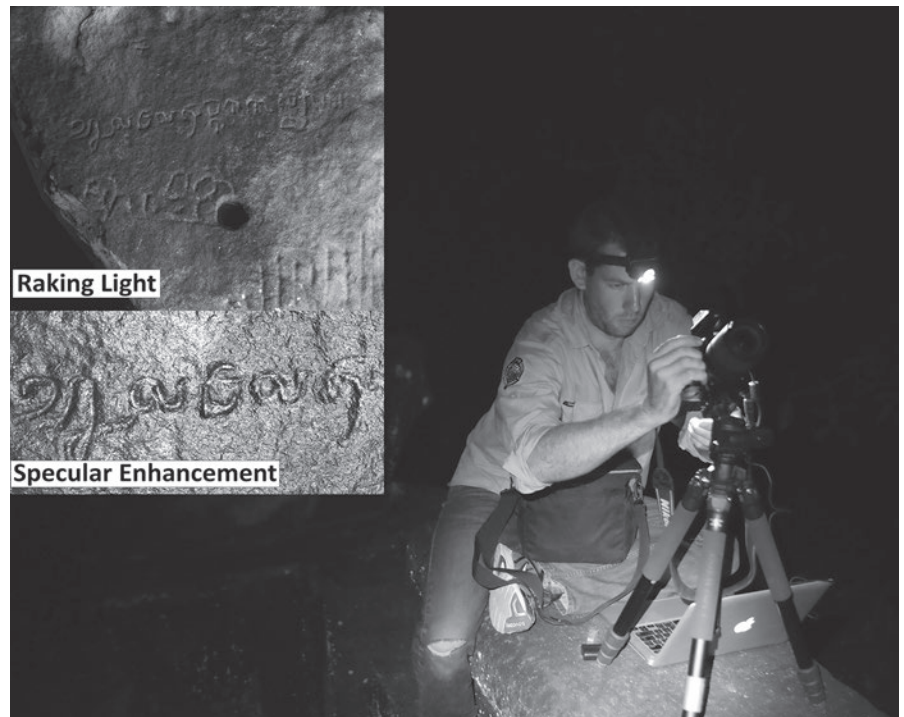


Figure 7. RTI documentation of the short inscription discovered at the main sanctuary.





Figure 8. Preparing for the final feast.

## Inaccessible features were documented with *Bakan One*.

different white plasters, as well as traces of green and red pigments on some of the lintels and other architectural elements. We documented the locations of the remaining pigments and collected samples for further analysis to investigate the raw materials and alteration of the colors.

Last but not least, the UCLA Team discovered a new short inscription in the upper parts of the west side of the main sanctuary. Despite problematic accessibility, we decided to use reflectance transformation imaging (RTI)—a technique based on the photographic capture of a surface under different lighting angles—to document the inscription. After obtaining permission from the authorities, we entered the temple at night and successfully deployed the RTI, despite the challenges of working in unstable ruins with limited visibility (Figure 7). The most amazing thing about this field season was that, while wandering and prospecting inside the first and second enclosures of Bakan, we kept finding new things, day after day.

In Cambodia, for a field season to be successful it must end in the Khmer tradition of a whole pig barbecue feast, and so it did (Figure 8). Needless to say, this

was indeed the most memorable moment of the entire 2016 field season. In conclusion: fantastic location and terrific project but more importantly: great people and formidable ambience—in other words, a rich and unforgettable experience.

Additional information can be found at <http://pkks.sscnet.ucla.edu/>.

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## Transitions to Sociopolitical Complexity: The View from Laguna Canyon, Santa Cruz Island, California

Scott D. Sunell

DURING THE EARLY YEARS of the second millennium A.D., the transition to sociopolitical complexity among the Chumash, living in the Santa Barbara Channel region, included reorganization of labor control, resource access, and craft production (Arnold 2001). Increasing connections between the islands and the mainland were facilitated by the transfer of a currency of beads made of *Olivella biplicata* shells. This exchange profoundly altered the nature of sociopolitical life in the region (Arnold 2001; Kennett 2005; Pletka 2004). During the late Middle (A.D. 500–1150), Transitional (A.D. 1150–1300), and Late (A.D. 1300–1782) periods, craft specialization developed among these complex hunter-gatherers. It was focused on two finished goods critical to the incipient regional economy: chert drills and *Olivella* beads (Arnold 2001; Perry 2004; Preziosi 2001). Production processes were streamlined, material inputs controlled

Connections between the islands and the mainland were facilitated by the transfer of a currency of beads.

and standardized, and manufacturing knowledge restricted to limited individuals and groups. On the eastern part of Santa Cruz Island, where large chert outcrops of good quality were present, craft producers focused on drill manufacturing, resulting in the development of increasingly specialized drill forms adapted to constraints of the chert and the types of shells used in bead making (Arnold 2001; Nigra and Arnold 2013; Perry 2004). On the western part of the island, large sandy beaches provide the preferred habitat for *O. biplicata*, creating a local advantage in the collec-





Figure 1. A view of the sea from SCRI-849. The abundance of vegetation in the canyon bottom shows where the water flows.

tion of these shells for bead production (Arnold and Graesch 2001). Finished drills made in the east were shipped to bead makers at western sites, where beads were then produced and thence traded throughout the region, from the islands to the mainland and back.

My goal is to expand the existing data on small-scale subsistence and craft production among complex hunter-gatherers in the context of these epochal changes in sociopolitical organization. Fieldwork for the project took place in Laguna Canyon, the largest drainage on the south side of Santa Cruz Island, over four seasons (2012–2015). I conducted a survey and auger project in 2012 to identify the pattern of occupation still evident and to assess the impact of erosion and historic ranching practices on site survival. This work included the identification and recording of 11 distinct sites throughout the drainage, ranging from the beach itself to an area nearly 3 km inland. Of these sites I focused my fieldwork at the two best preserved: SCRI-845 and SCRI-849. I excavated SCRI-845 in 2013 and 2014. The site is located near the beach and dates to the later Middle period (around A.D.

700–950). It yielded coarse igneous cobble tools and a diverse assemblage suggesting a range of craft production and subsistence activities. In 2015 I excavated SCRI-849, located inland from SCRI-845 and occupied from the end of the Middle period into the Transitional period (around A.D. 800–1200), to compare both occupations and production patterns.

Laguna Canyon is well watered and today hosts a large stand of mixed cattails (*Typha* spp.) and tule reeds (*Scirpus* spp.) at its mouth, among other anthropologically relevant marsh and riparian plant species, such as *Baccharis* spp. and *Salix* spp. The canyon is located at the greatest exposure of the Sierra Blanca volcanic formation (Weaver 1969). The large size of the drainage leads to a continual erosion of igneous cobbles from the conglomerate bedrock. Among the many types of stones available, rhyolite, andesite, and quartzite were most commonly used for tool production, and assemblages from sites throughout the drainage suggest that lithic production in Laguna Canyon focused heavily on this resource. At most sites in the canyon, densities of chert flakes are low





Figure 2. Augering provides detailed but limited data about the contents of site deposits, allowing for targeted excavation without the need for large exposures. This is especially important at delicate sites like SCRI-849, located on a poorly consolidated slope, shown here. Pictured is most of the field crew in 2012. From left to right: Scott Sunell, Dylan Smith, and Amber Madrid. (Photograph by Lana Martin)

## Initial patterns of the material suggest a diverse subsistence base.

compared to densities of igneous flakes. The presence of these resources, vegetable and mineral, meant that those living in Laguna Canyon during the Middle and Transitional periods had access to a suite of important materials at their doorsteps. Tule reed boats, stiffened internally with willow poles, are among the products critical to daily subsistence activities—as well as to travel and communication—that could have been created using the resources of Laguna Canyon (Hudson and Blackburn 1979; Hudson et. al. 1978).

My fieldwork has already yielded an assemblage

dating from the beginning of the eighth through the early thirteenth century A.D., at both SCRI-845 and SCRI-849, as well as the other sites augered during the 2012 season. Analysis in the Channel Islands Lab has yielded even more interesting insights into daily life in Laguna Canyon more than a millennium ago. Typical work in the lab revolves around sorting and identifying the components of midden, ancient refuse that provides detailed evidence for a range of activities at the site, recovered from the various sites in my study. The Island Chumash diet was rich in marine life, and the shells and skeletal material from these animals preserve incredibly well in the climate of southern California, so this work tells us much about subsistence practices. Learning and understanding the task of identifying each type of shell and the various other components of the midden in order to separate them from one another for analysis is the first skill necessary for those who work in the Channel Islands Lab.

Analysis consists primarily of classifying the sorted faunal remains into shellfish, bony fish, cartilaginous fish, and other vertebrate remains (reptiles, birds, mammals)—along with lithics, botanicals (typically carbonized seeds), and asphaltum (naturally occurring tar). In contrast to some of the other laboratories in the Cotsen Institute, it is possible to bring significant quantities of archaeological material into the lab, partly because the Channel Islands are in the United States. So the Channel Islands Lab can provide undergraduate research volunteers, mostly anthropology majors, with a chance to experience archaeological lab work firsthand. With Jeanne Arnold as its founder and director, the lab has been as important as any field school in educating future generations of archaeologists in lab techniques and artifact identification. Students who have worked in the Channel Islands Lab have gone on to successful careers in academia or CRM, supported by their experiences on campus alongside those in the field.

Although the lab processing and sorting for my project is still ongoing, the initial patterns of the material suggest a diverse subsistence base, including a number of cranial and postcranial elements from





Figure 3. Completed excavation at SCRI-489, July 2015. Site deposits at this location were nearly 2 m in depth, spanning about five centuries of occupation during the late Middle and Transitional periods. (Photograph by Amber Madrid)

juvenile seals (*Otariidae* family) and a wide range of elements from different species of rockfish. Fishing and marine mammal hunting were certainly part of life in Laguna Canyon, though to estimate the intensity with which these activities were pursued at SCRI-845 and SCRI-849 will require more complete results from the sorting process. The lithic assemblage is similarly diverse, though the majority of the material recovered is from the low-quality Blanca-formation igneous types. Santa Cruz Island chert is the next most common tool-stone in the assemblage; most of it is found in the form of biface thinning flakes or pressure flakes. A small number of projectile points, assumed to be harpoon points based on their morphology, have also been recovered. Though connections between these artifacts and the marine mammal remains at the site are likely, establishing the connections definitively will require further analysis. Small amounts of obsidian, mainland chert, and fused shale compose the remainder of the lithic assemblage. These exotic tool-stone types are present in very small quantities, represented exclusively by very small pressure flakes and debitage. The density and type of flakes of the materials suggest careful retouch of finished tools rather than production. *O. biplicata* detritus, increasing densities of which are associated with intensifying bead production during the Transitional period (Arnold 2001), is relatively sparse in the Laguna Canyon assemblage.

## Producers became part of a larger regional economy.

Very few Middle- to Transitional-period Santa Cruz Island chert drills have been recovered, though some drill-like igneous flakes suggest the possibility of alternative modes of bead production.

As the sorting process nears completion, I will conduct a range of analyses to evaluate the permanence of the occupation of Laguna Canyon, both seasonally and through time, and to identify tool use-wear patterns and preserved residues associated with tool function. This work will provide a detailed snapshot of Middle- and Transitional-period life in Laguna Canyon spanning five centuries, establishing a diverse Middle-period assemblage from small sites to expand our understanding of sociopolitical dynamics during this critical period in Chumash history. Beyond the impact of this work on regional analyses of sociopolitical complexity, this project has the potential to contribute critical data to the developing understanding of complex hunter-gatherers and their place in the story of cultural change through time globally.





Figure 4. Black abalone (*Haliotis cracherodii*) in situ during excavation. A collapse dated to around A.D. 1200 heavily disturbed the higher levels of this excavation unit, leaving whole shells like this one oriented vertically.



Figure 5. Small bone whistles such as this are common finds at Chumash sites in the northern Channel Islands (Hudson and Blackburn 1980). Similar whistles were an important component of the Barracuda dance (Hudson et al. 1981). Although not present on this example, many such instruments have elaborate incised designs or beads attached with asphaltum.

Humans respond to large-scale problems with a range of group solutions, such as political centralization, violent competition for resources, and migration (Carballo 2012). Specific responses to the challenges of the Santa Barbara Channel region during the Middle period appear to have contributed significantly to the sociopolitical integration evident during the Late period (Arnold 2001). The short time frame of the development of sociopolitical complexity and the associated development of specialized craft production supports the argument that, in the Chumash case, bead making and economic integration across the channel developed out of the context of challenges during Middle period (Arnold 1992; Arnold et al. 2015; Graesch 2004; Kennett 2005; Lambert 1997). The small-scale, locally contingent innovations of the Middle period, during which time evidence for sustained complex sociopolitical organization is lacking, set the stage for the development of the bead industry. These data are especially important for understanding how local producers become incorporated in developing regional economies.

I hope that lab work conducted at UCLA will help identify changes in local resource exploitation dur-



ing the Middle period, allowing us to understand this context more fully. This work will begin to shed light on how individual producers or households became part of a larger, more integrated regional economy as that economy arose for the very first time during the Transitional period. The problems faced by the Island Chumash during the Middle period and later in many ways run parallel to the challenges a globalizing economy presents to individuals and regions in the modern world. Over the past three centuries, the world has seen this same process occur on an unprecedented scale. Thanks to the excellent preservation of sites on Santa Cruz Island, data drawn from the period of the development of specialization among the Island Chumash have the potential to provide valuable specifics to help us understand in great detail how the choices of individuals or communities impact developments on a much larger scale, over a broad span of time. This project aims in part to evaluate the responses of ancient people to these challenges and opportunities in the context of an expanding economic system that favored efficiency of production and local control of certain aspects of the economy. While excavation is the first step in the research process, it is the meticulous and at times tedious lab work done in the Cotsen Institute that generates the fine-grained data that will help answer these questions. Along the way, the Channel Islands Lab provides invaluable undergraduate research opportunities and experience with the kind of work that characterizes the majority of an archaeologist's professional career.

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## Cave Temples of Dunhuang: History, Art, and Materiality: Thoughts at the End of a Symposium

Lothar von Falkenhausen

*The international symposium Cave Temples of Dunhuang: History, Art, and Materiality took place at the Getty Institute and at UCLA on May 20–21, 2016. It complemented the exhibition Cave Temples of Dunhuang: Buddhist Art on China's Silk Road, which celebrated almost three decades of successful collaboration between the Dunhuang Academy and the Getty Conservation Institute in conserving the priceless painted murals at the Mogao Caves. Thirty specialists from China, Europe, and North America (including seven from UCLA) shared their current research on various aspects of Dunhuang studies. The event honored the life and work of Fan Jinshi 范錦詩 (born 1938), who, during her term as director of the Dunhuang Academy, successfully integrated that institution into worldwide scholarly networks. The following are remarks I delivered at the Lenart Auditorium at UCLA at the conclusion of the symposium on May 21.*

These finds have become the touchstone for the study of Medieval East Asia.

THE MOGAO CAVES AT Dunhuang, in present-day Gansu Province, China, are an ancient site of Buddhist worship, located in a small oasis on the eastern end of the famous Silk Routes. Dating from circa A.D. 400 through circa A.D. 1400, the 492 or so caves contain the most comprehensive ensemble of Buddhist-themed wall paintings anywhere in the world. Since 1987 they have been inscribed in the UNESCO World Cultural Heritage List. But the Mogao site is also famous because of the discovery, in 1900, of a sealed cave (Cave 17) that was filled with tens of thousands of manuscripts, printed books, paintings, and religious items that had lain untouched since being hidden away at the beginning of the eleventh century A.D. Now curated in libraries in Beijing, Paris, London, Saint Petersburg, and elsewhere, the finds from this





Figure 1. The author delivers his presentation in the Lenart Auditorium on May 21, 2016.

“hidden library” have become the principal touchstone for modern medieval studies in East Asia.

In recent years, we in Los Angeles have had too few opportunities to see truly first-rate exhibitions devoted to Chinese art and culture. Hence we are very much in the debt of the Getty Conservation Institute for sharing the fruits of its very successful decades-long collaboration with the Dunhuang Academy. I think I can speak for everyone here in expressing my hope that that collaboration will continue to flourish for the indefinite future. I am by no means a Dunhuang expert, but I feel very fortunate to have met in person all the four individuals who have served as directors of the Dunhuang Academy (formerly the Dunhuang Institute) in its more-than-seven-decades-long history—four extraordinary personalities who have worked tremendously hard, often under difficult conditions, to preserve Dunhuang’s incomparable treasures for posterity. When I was a student in Beijing in 1979–1981, I was introduced to the late director Chang Shuhong 常書鴻 (1904–1994; in office 1944–1982), and I remember vividly how one evening he took me along to the Beijing Capital Theatre to attend the premiere performance of a play, *Jijicao* 芡芡草, in which he was portrayed as the main protagonist. It was a great play. I don’t know whether it has ever

been revived since, but it should be. Later, at Stanford around 1990, I also met the late director Duan Wenjie 段文傑 (1917–2011; in office 1982–1998) on one of his lecture trips to the United States. I first became acquainted with our much-beloved Director Fan (in office 1998–2015) during my so far only visit to Dunhuang back in 1980, and I have met her many times since. I am very happy also to have had several opportunities to meet her successor, Director Wang Xudong 王旭東 (in office since 2015), whose forward-looking, scientifically grounded vision for the Dunhuang Academy and the Dunhuang caves I very much admire.

Archaeologists like myself are used to taking a local perspective: we develop our worldview outward from the site we are most familiar with, ideally because of having excavated it ourselves. Such a view seems congenial with recent trends in the field of Central Eurasian history. It is my impression that scholars have now turned away from the romantic nineteenth-century notion of a “Silk Road” allegedly connecting the eastern and western edges of Eurasia. Instead they have striven to focus on the vast area in between as a many-stranded network of trade routes, and they have started to take a careful look at historical developments within each node in this network. In the



process, it has been realized that for the local inhabitants of each locality, East–West relationships along the so-called Silk Road were almost invariably secondary to North–South relationships—the often uneasy, ever-shifting interactions between the inhabitants of each oasis town with its neighbors in the northern steppes and in the nearby mountain ranges. The configuration of these relationships and their historical trajectories differ from place to place and need to be understood in all their local complexity.

Dunhuang, thanks to the unique primary materials from the “Library Cave,” provides by far the best-known instance for such a situation. Located on the western end of the Hexi Corridor that links the Chinese heartland to Central Asia, of course it served as a relay station in transcontinental trade during those periods when geopolitical conditions allowed this. As such, it indubitably was a place of cultural encounter. But it was not—at least not during the second half of the first millennium A.D. and to my knowledge has never been since—a multicultural or multiethnic

## Scholars have turned away from the nineteenth-century notion of a Silk Road.

community. Instead Dunhuang was, throughout its recorded history, the westernmost instance of a full-fledged, mainstream Han Chinese community; for most of this time it was fully integrated in the administrative system of the Chinese Empire. In these respects it differed from the oasis polities in Xinjiang and farther west. Thanks to the splendid research performed by scholars from many nations on the materials from the Library Cave, we have come to know the life and the inner workings of Dunhuang’s local society during the second half of the first millennium A.D. better than those of any other contemporaneous community in the Chinese culture sphere.

Figure 2. One of the replica caves in the exhibition *Cave Temples of Dunhuang: Buddhist Art on China’s Silk Road*, on view at the Getty Center from May 7 to September 4, 2016. (Image © J. Paul Getty Trust, 2016)







Figure 3. Another replica cave on view at the Getty Center. (Image © J. Paul Getty Trust, 2016)

As Victor Mair pointed out in his keynote lecture, local place-names in the Dunhuang area—possibly even Dunhuang and Mogao themselves—may well have an Indo-European origin, survivals of early settlement by groups linked to areas farther west. But throughout the period documented by the texts from Cave 17, Dunhuang was, ethnically, a Han Chinese community. It is true, moreover, that the Library Cave has brought to light manuscripts in at least nine different languages. But in light of the overwhelming majority of materials in Chinese, there can nevertheless be no doubt that the language spoken by the local population of the Dunhuang oasis was a North Chinese vernacular. It is true as well that Buddhism was originally a foreign religion, but the Buddhism documented in Dunhuang is a distinctively Chinese manifestation of that religion, greatly modified from its prototypes in the Indian and Iranian worlds.

Archaeological finds in Dunhuang and elsewhere along the western Hexi Corridor attest that this area was settled by mainstream (Han) Chinese people during the Han period (206 B.C.–A.D. 220). It remained a refuge of Han-derived cultural traditions under a

## Buddhism succeeded in grafting itself onto earlier religious traditions.

succession of local regimes when central China was mired in chaos during the period of the “Sixteen Kingdoms of the Five Barbarians” 五胡十六國 (circa 317–439). The earliest Buddhist caves at Mogao, dating to that very period, saliently document the adaptation of both Buddhist religious ideology and Buddhist art forms to the needs of the local Han Chinese community—needs that were linked to sociocultural realities that had grown over many centuries. The reason why Buddhism was able to become, at least for a long time, the dominant religion in the region was that it succeeded in grafting itself onto earlier religious traditions, in many cases without replacing

them. As a case in point, the texts found in the Library Cave attest that Chinese popular religion as well as the Chinese high religion of Taoism were part of the intellectual universe of the Buddhist religious specialists at the Mogao monasteries.

The painted caves at Dunhuang, too, were by no means the work of artists or artisans who had come to Dunhuang from afar, perhaps in the entourage of proselytizing monks. If that had been the case, one would expect them to be more similar than they are to their putative prototypes in India, the Iranian world, and Xinjiang. Instead, the Mogao Caves (as well as

## Cave temples were memorials commissioned by local families.

other Buddhist caves along the Hexi Corridor and elsewhere in the Chinese heartland), in their plan and building technique, much more closely resemble the multi-chambered elite tombs that had come into widespread use in the Chinese heartland during the Han period and continued to be used under subsequent dynasties. The most likely reason for this similarity is that the caves must have been constructed by the same teams of professional builders who also constructed multi-chamber tombs. In the same vein, both types of constructions were outfitted with mural paintings by the same teams of professional painters. These were, of course, ethnically Han Chinese professional groups, organized according to time-honored Han Chinese social patterns. They are unlikely to have been guided by any strong religious ideological beliefs but were both competent and ready to provide clients from all walks of life with the kind of artwork they commissioned, tapping into different iconographic systems.

During this conference, this point was substantiated from a Buddhological perspective by Robert Sharf, who pointed out that the Mogao Caves are likely to have differed from earlier cave temples elsewhere, not only in their form and decoration but also in their function. Based on his painstaking work with the pertinent textual sources, Professor Sharf has been able to show that cave temples were in all likelihood not publicly accessible worshipping spaces, such as are commonly found in cave temple complexes in

India and in Xinjiang, but memorials commissioned by local families. Placed on the grounds of temples that were built in the valley in front of the caves, which did provide public worshipping halls, the caves were taken care of by the resident Buddhist clergy and opened only rarely for special commemorative ceremonies attended by members of the donor families. Most of the time, they were shut, not coincidentally just like chamber tombs. As it turns out, the custom of constructing such caves was a kind of Buddhist add-on to traditional funerary practices. It was very much in keeping with long-established Han Chinese social patterns, and the differences vis-à-vis areas farther west illustrate how an originally foreign cultural element—the cave temple—was adapted by the Han Chinese inhabitants of Dunhuang to fit their own customs and needs. Though at variance with what we read in the conventional literature about cave temples in China, Professor Sharf's interpretation appears to me eminently convincing, and I would like to use this opportunity to highlight its importance.

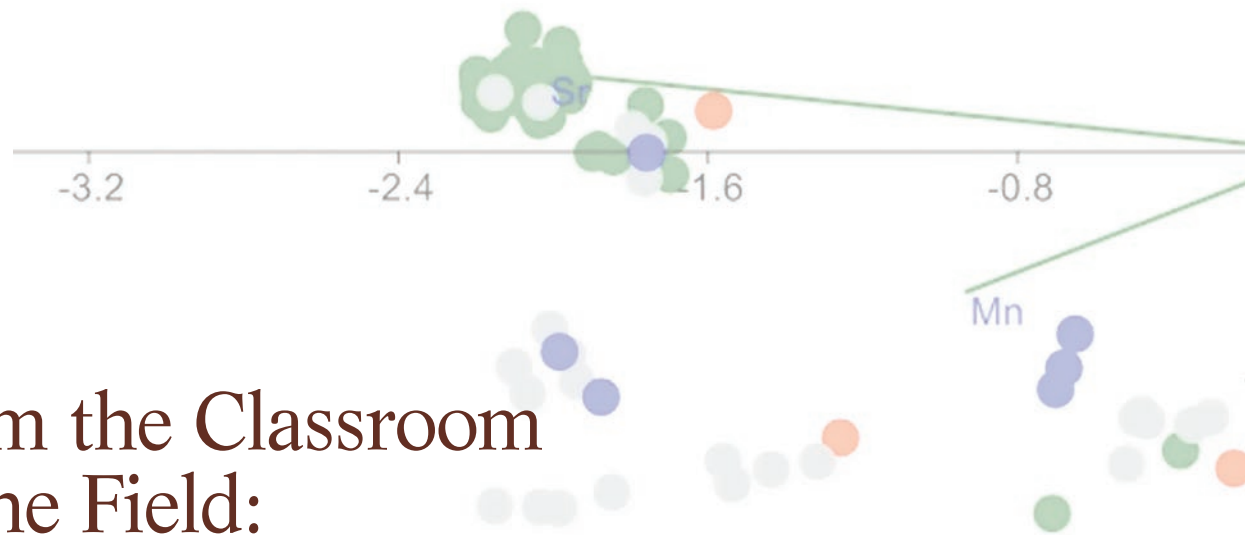
I would like to point out, moreover, that Professor Sharf's insights seem very much compatible with some of the discussions of the iconographic programs of the caves that we have heard at this symposium, in particular in the papers by Sonya Lee and Eugene Wang. Both emphasized that the painted decoration, even when ostensibly narrative, was not necessarily meant to be didactic. Professor Wang's idea that the iconography was essentially designed to perform itself—eternally, without a viewing public assumed to be present, very much in parallel with the painted decor of Chinese chamber tombs—becomes especially evocative when considered in conjunction with Professor Sharf's ideas. The details, of course, will need to be filled in by the specialists.

I wanted to add these archaeologically informed remarks to what has been voiced during the symposium. Time does not permit me to add anything more, even though much could be said about each of the presentations. In closing, let me compliment all participants on their stimulating and often eye-opening papers. I have been much inspired by this symposium, and I am certain that I am not alone in feeling that way.





Figure 4. A third replica cave on view at the Getty Center.  
(Image © J. Paul Getty Trust, 2016)



## From the Classroom to the Field: Archaeological Science on the Move

*Christian Fischer*

THE IMPORTANCE OF archaeological science to the study and understanding of past societies and cultures has long been recognized. Early approaches consisted of researchers from the physical and natural sciences participating in archaeology-based projects (Jones 2004; McGovern 1995). Despite claims of a lack of understanding between “scientists” and “archaeologists” and divergent views about their respective roles (Dunnell 1993; Henderson 2000; Thomas 1991), the integration of analytical techniques and methodologies into archaeological inquiry was very successful (Jones 2004; Killick 2005; Pollard 1995, 2004; Pollard and Heron 2008). Impressive results and the recent development of new or significantly improved analytical methods (Boivin 2000; Hosler 1993; Killick 2015) have led to exponential growth of a trend that has permitted science and archaeology to converge synergistically through the medium of material culture. Interdisciplinary fieldwork, communication, and education have been listed among the key ingredients

### Can a student of archaeology become a competent analytical scientist?

for fruitful cooperation between the physical and natural sciences and archaeology (Pollard and Bray 2007). Of particular interest here is the importance of the educational component, which the latter authors expressed by the question: “Can a student of archaeology with little, if any, formal training in the sciences really become a competent analytical scientist?” The answer, based on their experience, is that some can. While this response appears rather restrictive, and rightly so, it is believed that most students in archaeology have the capacity to acquire at least the basic scientific knowledge and skills needed to communicate and interact constructively with the “science” world. This statement also implies a shift in the paradigm of educational needs to address the broader scope of



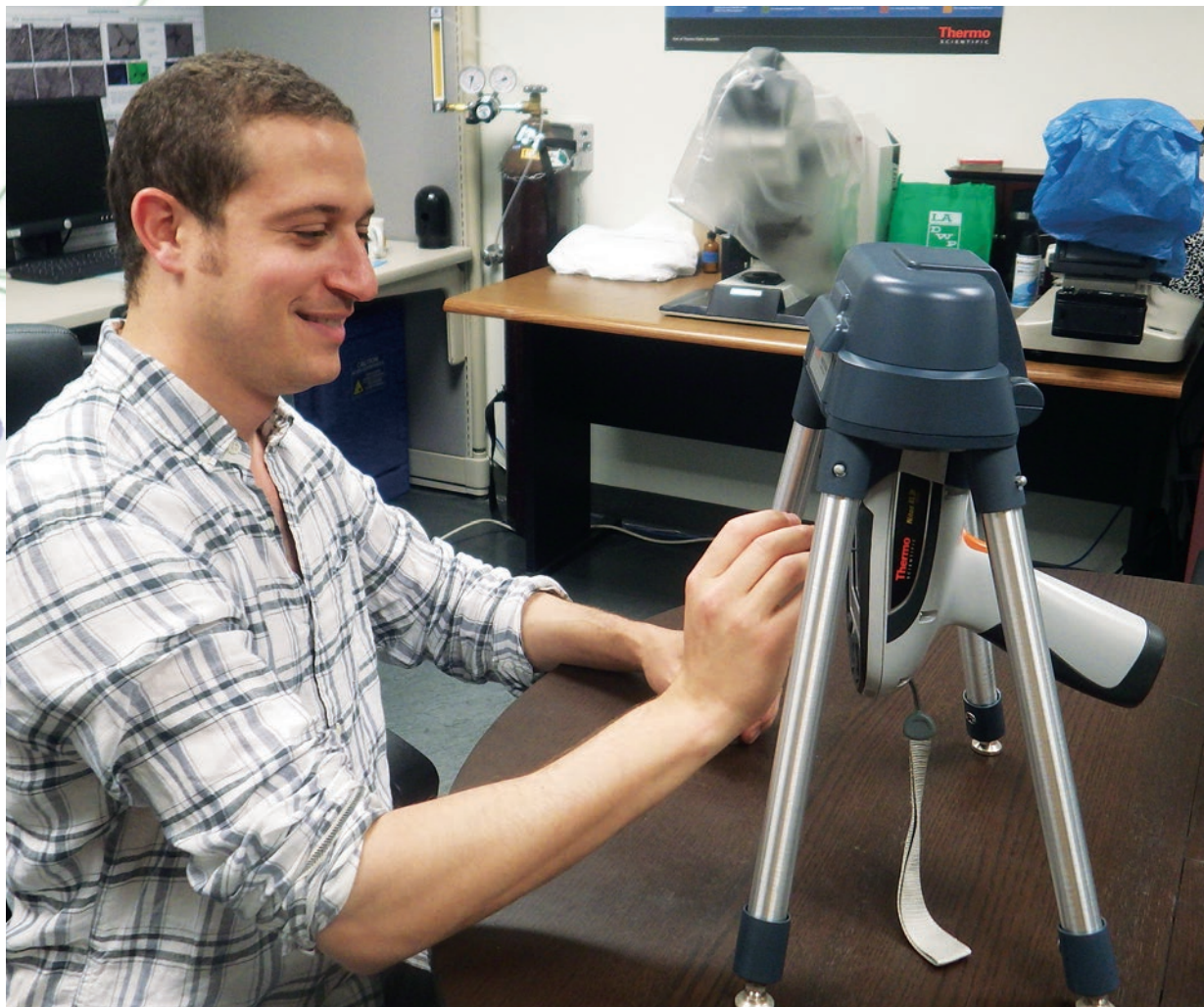


Figure 1. Brett Kaufman collects compositional data on slag samples from ancient Carthage with a Niton pXRF instrument.

learning across a range of scientific disciplines and analytical techniques.

There is a pressing demand from the students themselves, who are well aware of the power of scientific investigations in current archaeological research. On the other hand, those students, often with little scientific background, face real challenges when confronted with new and diverse theoretical frameworks and scientific concepts introduced through the study of the physicality of material culture. A modest contribution to these now well-established requirements, goals, and challenges was the course Portable Technology for Materials Analysis, given in 2012 at the Cotsen Institute of Archaeology. Four years later, it's time for a retrospective look at its educational impact and tangible research outcomes. Although it was offered to students of archaeology and anthropology, a few students from the Conservation Interdepartmental Program enrolled as well, leading to a diverse group of a dozen students with various backgrounds and, for the most part, little scientific experience.

The course was centered on the scientific analysis of archaeological materials, with a particular focus on

two noninvasive and field-deployable technologies: portable X-ray fluorescence (pXRF) and fiber optics reflectance spectroscopy (FORS). X-ray fluorescence provides data about the elemental composition and is particularly useful for the identification, and in some cases the sourcing, of materials. Compositional data obtained with pXRF instruments, especially for heterogeneous materials, have to be used cautiously, as the validity of pXRF-based sourcing studies is still vigorously debated (Frahm 2013; Speakman and Shackley 2013). Students in the class had access to two pXRF instruments: a Bruker Tracer III-V+ and a Niton XL3t GOLDD+. FORS can detect various inorganic and organic materials based on their reflectance. In the class, data were collected with a Fieldspec® 3 spectrometer (ASD Inc.) operating in the 350- to 2,500-nm spectral range. While pXRF has become increasingly popular among archaeologists for the analysis and sourcing of archaeological and cultural materials, combining this technique with FORS has shown to be very useful, as the two instruments provide complementary results. The objectives for students were threefold: to acquire theoretical back-

ground on both materials and techniques and to learn about scientific methods; to gain practical experience with pXRF and FORS while maintaining the necessary scientific and academic rigor; and to understand the advantages and more importantly the limitations of scientific investigations with pXRF for materials analysis and sourcing.

During one of the first classes, as a prerequisite to the use of X-ray-producing instruments, all students attended radiation safety training given by a UCLA health and safety officer and successfully passed the required exams. Lectures introduced the nature and composition of some common archaeological materials, the fundamentals and principles of pXRF and FORS, and methodologies for data collection and interpretation. In addition, each student was assigned a research project that involved analyzing and studying an archaeological material of her or his choice. The projects covered analysis of a wide array of materials and artifacts from different archaeological and cultural contexts, ranging from slags and *tuyères*,

Roman glass, and Etruscan building materials to fused shale, obsidian from California, Mayan terracotta figurines, and Chinese ceramics. Three of these projects are briefly presented below to exemplify the educational and research outcomes.

The first example is the project of Brett Kaufman on slags and *tuyères* from Phoenician and Punic Carthage. Using pXRF (Niton XL3t GOLDD+), Brett developed an analytical methodology for the rapid screening and characterization of archaeometallurgical slag and slagged *tuyères* (Figure 1). Analysis of the excavated material indicated that most of the produced metal was iron. Brett combined this work with other scientific techniques, such as optical and scanning electron microscopy, the latter coupled with energy-dispersive X-ray spectroscopy, to show that Carthaginian smiths conducted primary smithing and forging of wrought iron and steel, as well as some bronze recycling activities, all organized in a centralized industrial production. Detailed in his dissertation (Kaufman 2014), the research has provided a



Figure 2. Kristine Martirosyan-Olshansky analyzes obsidian artifacts from California with a Bruker pXRF instrument.



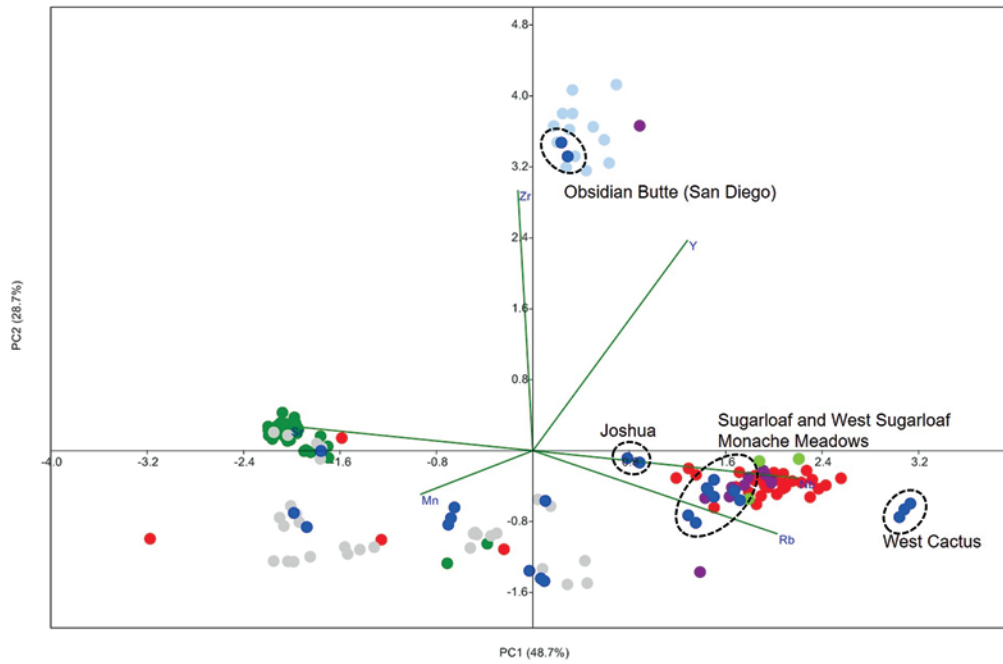


Figure 3. Principal component analysis plot of the compositional data of an obsidian artifacts assemblage and geological sources from California.

comprehensive view of early iron metallurgy from a diachronic perspective, spanning the entire reign of the Carthaginian Empire from its foundation to its destruction by Rome (814–146 B.C.). The research has also led to a better understanding of the role of iron in the emergence of Iron Age states in North Africa and the Near East; part of the results was recently published in the *Journal of Archaeological Science* (Kaufman et al. 2016).

The second example is the project of Kristine Martirosyan-Olshansky on the geochemical charac-

## The projects covered an array of artifacts from different contexts.

terization of an obsidian assemblage from the Fowler Museum consisting of 156 obsidian samples from various sites in California. Kristine analyzed the assemblage with pXRF (Bruker Tracer III-V+), together with geological and reference samples, in an attempt to assign compositional data to specific obsidian sources (Figure 2). Using elements bivariate plots and multivariate statistics, several distinct obsidian groups were identified based primarily on concentrations of iron and some trace elements, in particular niobium strontium, yttrium, and zirconium. Although obsidian source attribution remains challenging for such a

diverse assemblage, one group of artifacts could be confidently assigned to the Obsidian Butte source in San Diego County, while a large number of samples from obsidian-rich northern California sites clustered well with sources located within the Coso volcanic mountain range in central-eastern California (Figure 3). Finally, the spatial and temporal distribution of the obsidian artifacts provided useful insight on procurement patterns for this material in California. Preliminary results were presented and well received at the International Symposium on Archaeometry (ISA) in Los Angeles two years ago (Martirosyan-Olshansky et al. 2014), and a more comprehensive paper has been submitted to the *Journal of Archaeological Science Reports* (Martirosyan-Olshansky et al. 2016). Building upon this initial experience, Kristine developed her pXRF skills further and used the technique in her search for the provenience of obsidian artifacts from Armenia, which won her an award at the Eightieth SAA Annual Meeting in San Francisco (Martirosyan-Olshansky 2015).

Last but not least is the project of Ellen Hsieh on the analysis and sourcing of exported Chinese blue-and-white porcelain found in Southeast Asia. Ellen used both pXRF and FORS to analyze the glaze, the blue decorations, and the body of the porcelain sherds (Figure 4). She showed that compositional data obtained with pXRF allowed her to separate the products from the two main production sites, Jingdezhen and Zhangzhou, based on trace elements such as zirconium and thorium (Figure 5). As with Kristine's research, the preliminary results were presented at ISA 2014 (Hsieh and Fischer 2014), with further investigation detailed in a paper submitted to the *Jour-*

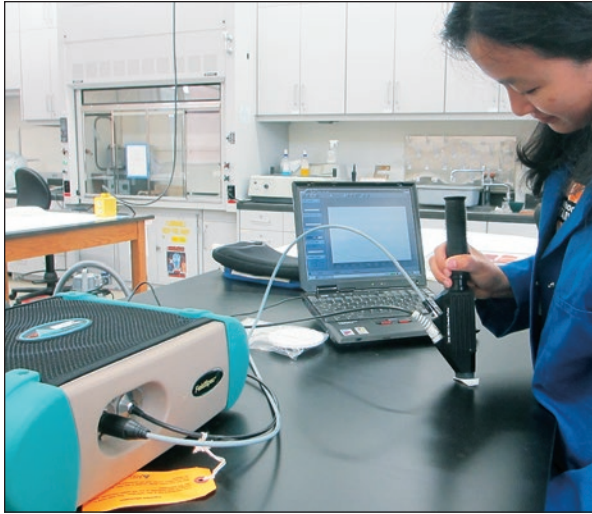


Figure 4. Ellen Hsieh deploys FORS on the blue decoration of a blue-and-white porcelain shard.

The students developed a scientific curiosity.

*nal of Archaeological Science*, currently under review (Fischer and Hsieh, submitted). Developing her scientific knowledge further, Ellen used pXRF and FORS to analyze large sets of blue-and-white sherds at the National Museum of the Philippines in Manila for her dissertation project. Recently, in the light of new findings, she has extended the research to the study of Japanese blue-and-white porcelain that was substituted for Chinese products in overseas markets during the maritime ban period in the early Qing Dynasty. This research was partially funded by a Hiroshi Wagatsuma Fellowship, and the first results were presented at the Eighth World Archaeology Congress in Kyoto (Hsieh and Fischer 2016), in a session cochaired by Ellen Hsieh. and entitled A Global Perspective on Southeast Asian Trade Ceramics in the Historical Period.

From both an educational and a research perspective, this course gave students an opportunity to learn and understand scientific concepts and methods through both a theoretical and a practical approach. More importantly, the students developed a scientific curiosity and applied what they learned to their respective dissertation research and other projects. Beyond the tangible outcomes, the course also fostered interdisciplinary interactions, not only with the

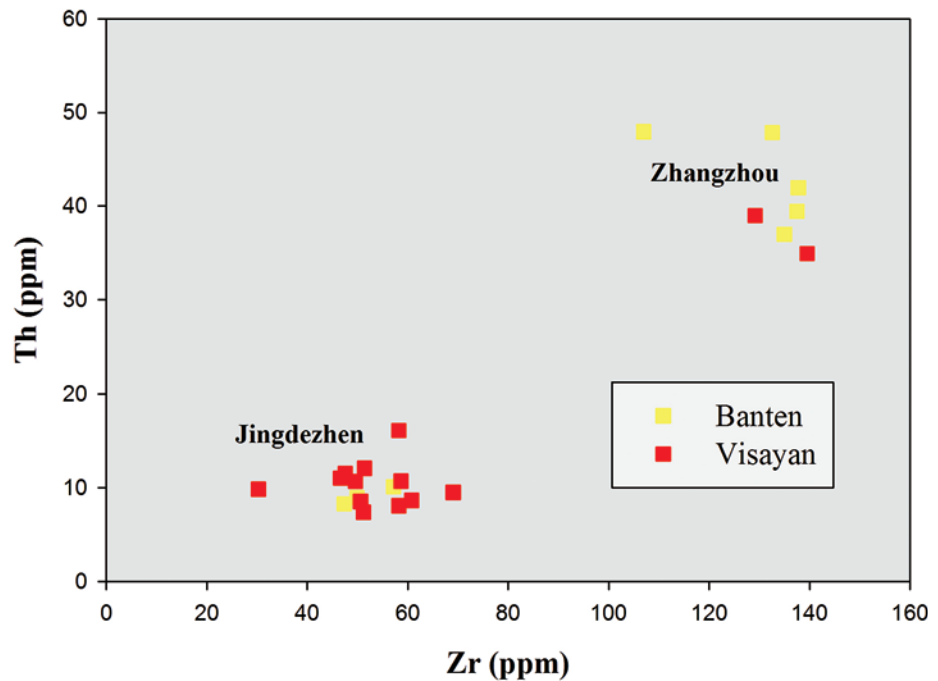


Figure 5. Bivariate plot of zirconium (Zr) versus thorium (Th) abundances measured with pXRF on the transparent glaze of blue-and-white porcelain shards found in Banten, Indonesia, and Visayan, the Philippines, but most likely originating in Jingdezhen or Zhangzhou in China.



various project topics meshing scientific and archaeological studies of material culture but also because of the diverse backgrounds and interests of the students. Graduate-level educational opportunities where science and archaeology are brought together are still too scant, however, and should be increased with new and tailored course offerings, perhaps integrated into the core curriculum. This would provide the solid base needed for the training of the next generation of archaeological or cultural scientists, who have the knowledge and skills to create flexible and dynamic entanglements between the physical and natural sciences and archaeology, which are essential to exploring, in a joint effort, the fundamental questions pertaining to our own past and future.

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## Writing Down the Bones: The Academic Achievements of Jane E. Buikstra

Gordon F. M. Rakita

THE TITLE OF THIS ARTICLE is an allusion to a 1986 book on writing by Natalie Goldberg. One of my professors suggested it when I was facing the seemingly insurmountable task of writing my dissertation. As a budding bioarchaeologist contemplating a large writing project, I was excited to read *Writing Down the Bones*, for obvious reasons. Think how disappointed I was when I discovered that little in the book was actually about bones. The book was helpful, but for inspiration regarding writing and publishing in bioarchaeology, I did not need to look further than Jane E. Buikstra, my dissertation advisor at the time and this year's senior laureate of the second triennial Lloyd Cotsen Prize for Lifetime Achievement in World Archaeology.

Buikstra has been writing about bones for more than 40 years and has more than 200 publications to her name; 100 of them have appeared in peer-reviewed journals. In the course of this tremendous output—indeed as result of it—the field of bioarchaeology has been established as a vibrant multidisciplinary endeavor. This article reviews Buikstra's publishing record. I also discuss her influence on the



Jane Buikstra  
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for more than  
40 years.

field through two important organizations and her advising of doctoral students.

Buikstra first used the term *bioarchaeology* at the 1976 Southern Anthropological Society Annual Meeting in Atlanta. The term had been used four years earlier by Cambridge archaeologist Grahame Clark as a synonym for *zoarchaeology*, and in the United Kingdom the moniker later came to include references to other biological material from archaeological contexts. Clark's work at the Mesolithic site of Star Carr was intentionally multidisciplinary. However, Buikstra envisioned a field of study that was at once more restricted, in that it focused on human burials, but simultaneously equally multidisciplinary. This American version of bioarchaeology was influenced by both the New Physical Anthropology and the New



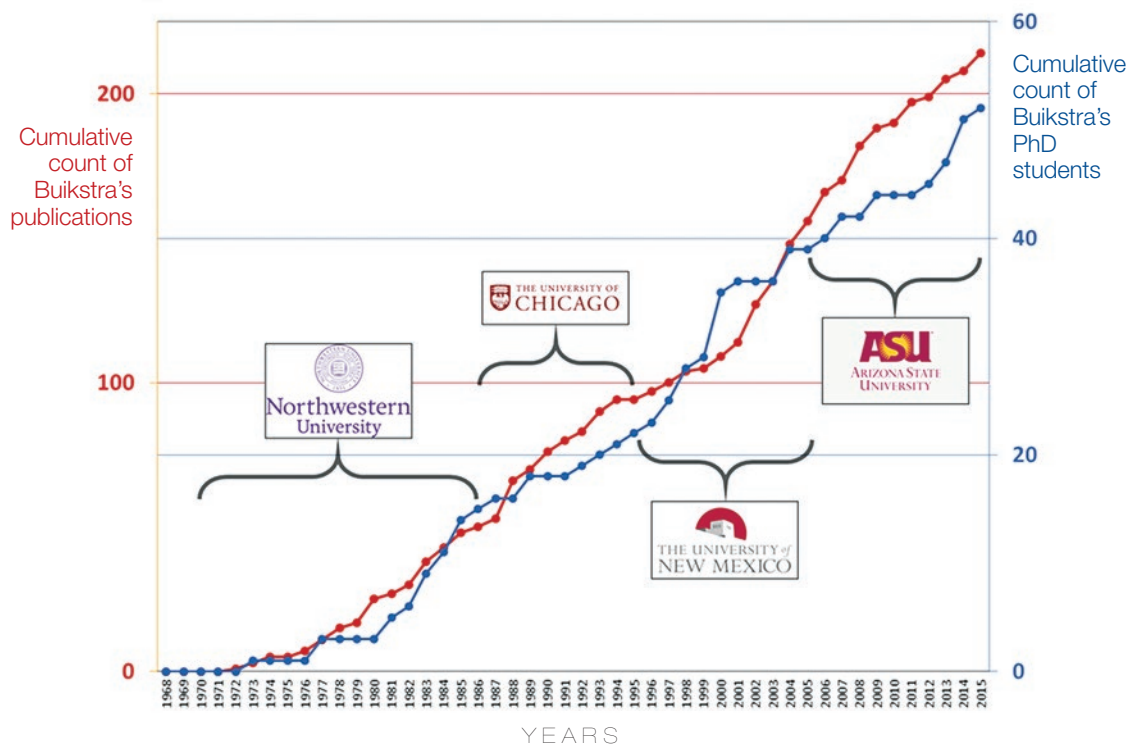


Figure 1. Summary of Jane Buikstra's career, showing the number of publications (left) and the number of graduate students (right).

Archaeology movements of the 1950s and 1960s. Buikstra's vision was to approach human burials from archaeological contexts from both a regional and a diachronic perspective, with research that was based in the analysis of populations rather than individuals, that was biocultural in outlook, that was explanatory rather than simply descriptive, and above all that emphasized answering anthropological research questions, not simply archaeological or physical anthropological ones. Buikstra sought to extricate the examination of human remains from the appendices of site reports and to expose them to the nuanced and comprehensive examination that such a rich archaeological context deserved.

An examination of trends in the field of bioarchaeology in the United States (Rakita 2014) shows that while bioarchaeological publications were slight at first, in the past 20 years there has been a considerable uptick in published bioarchaeological works. Certainly the passage of the Native American Graves Protection and Repatriation Act in 1990 and the publication of *Standards for Data Collection from Human Skeletal Remains* in 1994 had galvanizing impacts on bioarchaeology. For the 15 years prior, however, Buikstra had been publishing the foundational works of the bioarchaeological approach. These works had a positive impact on subsequent publishing in the field. In a recent Festschrift for Buikstra (Rakita 2013), I exam-

ined the trends in her published works up to 2005. In preparing this article, I updated my data set to include all her publications through 2016. In all, her curriculum vitae documents more than 214 separate publications between 1972 and 2016 (Figure 2). The additional 11 years of publishing data provide both a confirmation of my originally identified patterns as well as a few unique twists in the later decades.

Buikstra is as prolific now as she has ever been, with 10 or more peer-reviewed articles to her name each decade. I used Anne-Wil Harzing's Publish or Perish software ([harzing.com/pop.htm](http://harzing.com/pop.htm)) to analyze data retrieved from a Google Scholar search of Buikstra's publications. Her h-index is a very respectable 49, which indicates that 49 of her publications have been cited 49 times or more. By comparison, my own h-index is 8 and archaeological giant Lewis Binford's is 59. Buikstra continues to produce books (typically edited volumes), with at least three appearing each decade, except for the first decade of the 2000s, which saw the publication of nine. The number of book chapters she has produced has climbed steadily, reaching a peak of 36 in the period between 2000 and 2009. The 2010s are only about half over, so the jury is still out on that decade. In keeping with her multidisciplinary approach, Buikstra is highly collaborative in her publishing strategy. She has coauthored 165 publications and was lead author of about 20



Figure 2. Jane relaxing on-site in 1974.

percent of them. In terms of scope, a little more than one-third of her publications have been empirical in nature—that is, reporting data and analyses of those data. These empirical contributions continue to enrich the field as other scholars reanalyze these data or

compare their own data to Buikstra’s. For example, “Chemical Analysis of Excavated Human Bone from Middle and Late Woodland Sites,” published with Lambert and Szpunar in *Archaeometry* (1979), has been cited 143 times, or more than 3 times per year, and is the twelfth-most-cited publication on her vita. Equally important have been her methodological works. These publications report new or significantly innovative techniques and methods for examining bioarchaeological remains or analyzing data on those remains. Twenty-two percent of Buikstra’s publications have had a methodological scope, with key peaks in the 1980s and 2000s. The best example of these methodological works is *Standards for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker 1994), which has received more than 150 citations per year since its publication. It has become the guidebook for minimal data recording standards for analyses of human skeletal materials. This work is the most cited publication on her vita.

While Buikstra has a long record of making empirical and methodological contributions, she has



Figure 3. Diane Gifford-Gonzalez, Deborah Winslow, and Jane Buikstra as resident scholars at the School of American Research (now the School for Advanced Research) in Santa Fe, New Mexico, in 1984–1985.





Figure 4. Jane in 2013, screening at the Hopewell-period site of Mound House (Kampsville, Illinois).

lately increased the amount of historical and theoretical works she has published. Twelve percent of her publications in the first decade of the 2000s were theoretical in nature, and 14 percent were historical contributions. The best example of a historical work is *Bioarchaeology: The Contextual Analysis of Human Remains*, coedited with Lane Beck and published in

## Her influence can be observed in her training of generations of bioarchaeologists.

2006. This volume has received 149 citations in the past 10 years and ranks twelfth on her list of most cited works. Buikstra’s “Biocultural Dimensions of Archeological Study: A Regional Perspective,” the theoretical work that began the field of bioarchaeology in the United States, has been cited 130 times since its publication in 1977.

Buikstra’s curriculum vitae lists her engagement with field projects that have spanned the globe—from the Canadian Arctic to Argentina and from the Andes to Anatolia. Given this wide range of fieldwork experience, one would expect her publications to represent

a wide range of regional foci. Indeed they do, and the temporal spread of publications from various regions indicates Buikstra’s successive engagements with bioarchaeology in a series of locales. Earliest and most sustained is her involvement in the North American mid-continent, specifically the lower Illinois River valley. Forty-six (or 21 percent) of her publications involve materials and data from the mid-continent, and a decade has yet to pass when she has published fewer than five works on that region. “Fertility and the Development of Agriculture in the Prehistoric Midwest,” published with Konigsberg and Bullington in 1986, is one such mid-continental publication and ranks seventh on her list of most cited works. Her engagement with South American materials, especially those involving the Programa Contisuyu, centered in southern Peru, has seen steadily increasing publication output, ranging from 5 publications in the 1980s to 22 in the first decade of the 2000s. Her Andean works include “Ancestors and Social Memory: A South American Example of Dead Body Politics,” written with Ken Nystrom (2015). During the 1990s, Buikstra published six works relating to materials from Bronze Age Spain as part of her engagement with the Gatas Project. The subsequent decade saw the publication of 12 works relating to Mayan bioarchaeology, many taking advantage of new heavy isotope chemical analysis techniques.



Figure 5. Jane with Jason King, director of research of the Center for American Archaeology.

Similar to the fluctuating regional publishing patterns, the topical foci of Buikstra's works show intriguing chronological patterns. For example, examination of ancient diseases and pathologies was an early interest. Indeed, her fifth-most-cited work is a 1980 publication in the *Annual Review of Anthropology* entitled "Paleopathology: An American Account." This one work has received more than 200 citations, averaging more than 6 per year. Buikstra's publications on the topic have steadily increased, so that in the first decade of the twenty-first century she published 21 separate works relating to paleopathology. Particularly fruitful aspects of this research are new molecular and biomedical methods that have emerged (Klaus et al. 2010). Another example of a growing topical area of publication is mortuary analysis. While she published only one work on mortuary analysis in the 1970s, she published 12 in the first decade of the 2000s. For example, in 2009 she coauthored "Camelid Herders: The Forgotten Specialists in the Coastal Señorío of Chiribaya, Southern Perú," in a volume honoring Michael Moseley and published by the Cotsen Institute of Archaeology Press. The steady growth in this topic was no doubt spurred on by the processual approach to mortuary remains promulgated in the 1970s and the postprocessual critique of that approach in the 1980s and 1990s. These topical foci have expanded, while foci popular earlier have attenuated. For example, the 1980s show peak publication numbers for bio-distance studies (six publications) and demography studies (four publications). Publications related to the use of chemical analyses of human bone show

an interesting bimodal pattern, with high numbers in the 1980s (nine publications) and the first decade of the 2000s (seven). These two peaks represent different sorts of chemical analysis. The 1980s publications are related to the use of trace element and stable light isotopes (carbon and nitrogen) for dietary reconstructions of past populations. The publications from the 2000s tend to involve examinations of heavy isotope ratios (of strontium and oxygen) to assess possible population movements and migration.

Besides her direct contributions to the field through her scholarship, Buikstra has also nurtured bioarchaeology through her service to the field. She has been president of the Center for American Archaeology in Kampsville, Illinois, for more than 30 years. The center is known for its intensive summer courses, where hundreds of bioarchaeologists have received training in bioarchaeological methods. Moreover, the center has pursued a fieldwork program involving excavation of key prehistoric cemeteries in the region, the study of which has formed the backbone of many publications in bioarchaeology. In 2005 Buikstra became the founding director of the Center for Bioarchaeological Research at Arizona State University. Lodged as it is in an institution dedicated to breaking down disciplinary walls, this center is able to leverage connections across a wide spectrum of fields, including biochemistry, genetics, osteology, archaeology, anthropology, and medicine. The center also serves as the institutional home for the *International Journal of Paleopathology*, which Buikstra edits. Buikstra has also led some of the key professional societies



related to bioarchaeology. From 1989 to 1991 she was president of the American Anthropological Association. Prior to that (from 1985 to 1987) she served as president of the American Association of Physical Anthropologists. She has also served as president of the Paleopathology Association (2003–2005) and the Illinois Archaeological Survey (1977–1978). She has served on the editorial boards of more than seven professional journals, including the *Journal of Anthropological Research*, the *Journal of Forensic Anthropology and Archaeology*, the *International Journal of Osteoarchaeology*, *Evolutionary Anthropology*, and the *Journal of Anthropological Archaeology*.

Finally, Buikstra's influence on the field of bioarchaeology can be observed in her training of successive generations of bioarchaeologists (Figure 2). As of July 2016, 229 individuals listed in the Academic Phylogeny of Physical Anthropologists identified bioarchaeology as their specialization (Barr et al. 2016). Buikstra trained 7 percent of these bioarchaeologists. Her own vita lists 52 doctoral students: 18 from her time at Northwestern (1970–1986), 14 from the University of Chicago (1986–1995), 12 from the University of New Mexico (1995–2005), and 8 from Arizona State University (2005–present). Her average output of students is a bit more than one per year for 46 years. These students have gone on to train their own students, lead academic departments, and edit journals. Kathleen Reichs, Buikstra's first doctoral student, is the author of the popular Temperance Brennan novels and a producer of the *Bones* television show.

Through her publications, active leadership of key institutions, and mentoring of students, Jane Buikstra has profoundly influenced the development of bioarchaeology in the United States and across the globe. The bioarchaeological approach she advocates encourages researchers to take a multidisciplinary approach to the study of the lives of past people, allowing us to respond to problems facing humanity today. Her contributions to the field have been readily acknowledged in a variety of awards and honors, including election to the National Academy of Science (1987), the Archaeological Institute of America's Pomerance Award (2005), the T. Dale Stewart Award from the American Academy of Forensic Sciences (2008), the American Association of Physical Anthropology's Darwin Lifetime Achievement Award (2008), the Society for American Archaeology's Fryxell Award for Interdisciplinary Research (2010), and now the Lloyd Cotsen Prize for Lifetime Achievement in World Archaeology.

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# The Cotsen Laboratories

The theme of the 2016 issue of *Backdirt* is “Meanwhile, Back at the Ranch.” Previous issues mostly focused on fieldwork in exotic places, yet much archaeological work is done in the laboratories of the Cotsen Institute and elsewhere on campus. In the following pages we highlight this less glamorous but equally important aspect of archaeology.



## Anatolia Laboratory

*Elizabeth Carter*

The great majority of work in the Anatolia Laboratory in 2015–2016 involved analysis of Late Neolithic faunal remains from Domuztepe, Turkey, by Hannah Lau. This research formed the basis of her dissertation, “Mobility, Cooperation, and Emergent Political Complexity in the Late Neolithic Near East.” Additionally, she and fellow zooarchaeologist Sarah Kansa worked on “Zooarchaeology in the Era of Big Data: Contending with Interanalyst Variation and Best Practices in Data Publication and Use,” an article comparing their analytical results on selected faunal assemblages from Domuztepe.

Elizabeth Carter revisited several earlier projects, the materials of which are stored in the lab. She was invited by the University of Pennsylvania group working on final publication of discoveries made at ancient Lagash (modern Tell al-Hiba) to reexamine a system-



Cotsen Institute graduate student Evan Carlson introduces the next generation to the Anatolia Laboratory.

atic site survey that she had done in the 1980s. The research group is comparing the original records of the 1984 survey against a GIS created from remotely sensed imagery. The goal of this research is to examine the intrasite organization of a large (500-ha) Sumerian city. Along with Reed Goodman (University of Pennsylvania) and Elizabeth Stone (SUNY Stony Brook), Carter presented a paper on this work at the Tenth Annual Meeting of the Institut für Orientalische und Europäische Archäologie in Vienna, Austria, in April 2016.

Furthermore, Carter prepared a study entitled “Parthian Pottery from Well 508 in the Ville Royale at Susa” for a forthcoming *Festschrift*. The material was excavated in the 1970s and has never been published. In addition to presenting the pottery, the article suggests how future researchers might investigate occupation density and periods of abandonment in Susa by studying abandoned wells.





## Ancient Agriculture and Paleoethnobotany Laboratory

Alan Farahani

The Ancient Agriculture and Paleoethnobotany Laboratory is a recent addition to the many excellent laboratories at the Cotsen Institute. The laboratory continues the paleoethnobotanical tradition at the institute—that is, the analysis of archaeological plant remains to understand human cultures in the past. Why not “Paleoethnobotany Laboratory” then? One of the organizing research principles of the laboratory is to explore the relationship between agriculture and human communities worldwide through time. Hence members of the laboratory use methods beyond paleoethnobotany, including the analysis of animal bones (zooarchaeology), the analysis of soils (geoarchaeology), and even pottery reconstruction. These approaches, when integrated, can enrich our understanding of agricultural ways of life. To that end, the laboratory has been busy with archaeological projects related to agriculture from many parts of the world. The projects involve many different ecologies, ways of social organization, research questions, and directors.

An important mission of the lab is the involvement of undergraduate research participants, and this past year the laboratory was fortunate to have several such wonderful individuals, nearly all of whom graduated in the spring of 2016. A few of the students and projects are highlighted here. One of the largest undertakings was the Dhiban Excavation and Development Project, based at the archaeological site of Dhiban in central Jordan. Kyle Montgomery analyzed plant remains, bones, and artifacts excavated from a compacted surface in a 1,500-year-old structure at the site to understand how the space was used for agricultural storage. Francisca Bravo, Jessica Lopez, and Jessica Hudson analyzed heavy fraction remains (material collected through the process of sediment water flotation) from the same building to detect associations between archaeological plant remains, animal bones, and artifacts. Francisca Bravo, Cassandra Dadat, and UCLA alumna Kaitlyn Ireland also reconstructed two ceramic vessels when they noticed fragments in this heavy fraction joined together. The result of this effort can be seen in the 2015 issue of *Backdirt*.



Cotsen Institute undergraduate volunteers examine archaeological plant remains as well as other artifacts. Pictured are (clockwise from top left) Francisca Bravo, Cassandra Dadat, Kyle Montgomery, and Lina Ramirez. The center image shows 3,000-year-old barley (top) and broomcorn millet (bottom) seeds from an archaeological site in south-central Jordan. Not pictured are Jessica Lopez and Jessica Hudson.

As for other endeavors, Lina Ramirez analyzed archaeological plant remains from Wadi Fidan—a site in southern Jordan dating to a period not long after the adoption of agriculture (around 8000 cal. B.P.)—to explore how this community negotiated a relatively new agricultural way of life. She also examined plant remains from Kani Shaie, a site in northern Iraq (Kurdistan) dating to the beginning of urbanism (around 5000 B.P.). Cassandra Dadat investigated similar material from Edom, an emerging Iron Age polity in southern Jordan (circa 3000 B.P.). Next she analyzed seeds and wood charcoal from the archaeological site of Old Kiyangan in Ifugao in the Philippines (1000–500 B.P.) to identify how the local community restructured agricultural production and wood procurement before and after Spanish colonization. All these projects required many hours spent at the microscope, and all the participants rose to this challenge and exceeded expectations. While they will be sorely missed, it is hoped that their legacy and the projects they contributed to will live on in the laboratory. The Ancient Agriculture and Paleoethnobotany Laboratory looks forward to another year of “fruitful” research!

# The Cotsen Laboratories



## Andean Laboratory

*Ben Nigra, Terrah Jones,  
Kevin Hill, and Jacob Bongers*

The Andean Laboratory proudly inhabits the space once housing Chris Donnan's Moche Archive. It now serves as the nerve center for groundbreaking research on the Chincha and Cañete Valleys on the southern coast of Peru. Lab members bring together diverse thematic, chronological, and methodological interests to understand how this region emerged as a major hub of political and religious life and why it sustained this privileged position well into late antiquity.

Members of our lab are currently examining how Paracas, the first politically complex society in the region, developed from a set of disparate communities into a regional-level chiefdom. Ongoing excavation of monumental earthen *huacas*—massive structures that served as gathering places for ceremonial events—provides an unprecedented opportunity to investigate early autochthonous developments in earthen architecture and engineering, the coordination of labor via ritualized events, and emerging interregional interaction.

Turning to later antiquity, lab members also focus on the unique political and economic strategies employed by the first state in southern coastal Peru: the maritime kingdom of the Chinchas. New excavation and ethnobotanical analysis of Chincha domestic



Graduate student Jacob Bongers captures images of artifacts in the field laboratory in Peru.

and agricultural sites have yielded some of the first in situ data on the household economies of Chincha families and their relationships to valley authorities. With the late incursion of the Inca Empire into the southern coastal region, many aspects of Chincha life came to reflect a new set of social and political realities. Members of the Andean Laboratory investigate how Chincha peoples adopted aspects of Inca mortuary practice as a response to an evolving climate of power, new economic demands, and an ever-shifting politics of social identity and political membership.

Turning to the Cañete Valley and the broader Andean world, lab members bring ethnohistorical data to bear on the macro-level development of the Inca Empire and its effects on how we understand the pre-Columbian world today. The Andean Lab also hosts Paul Burtenshaw of the Sustainable Preservation Initiative, whose work and research lie at the intersection of heritage policy, preservation, and economic development.





## Armenian Laboratory

*Kristine Martirosyan-Olshansky  
and Peter Cowe*

The Chitjian Collection and Archive and the Research Program for Armenian Archaeology and Ethnography were established in 2013 by the generous endowment of Sara Chitjian. The original collection consists of the personal papers and possessions of Hampartzoum Chitjian, who settled in the United States after a circuitous journey through the Middle East, Europe, and Mexico. The collection therefore reflects the material culture of the last generation of Armenians of the Ottoman Empire, their subsequent displacement, and their new way of life in diaspora.

In the spring of 2016, the Chitjian Collection received a donation of letters, postcards, diaries, photographs, and books that had belonged to Kacher Berekian and Nevarte Berekian Nahabedian, who had been orphaned during the Armenian genocide and then were adopted and raised in the United States. The books, some of which are first editions, went to the Young Research Library and will be available through UCLA Library Services once they are cataloged. The Armenian Laboratory has created a database of the donated materials, and photographs of the objects have been uploaded to our website. The next step will be to make high-quality scans of the documents and to make them available online. This material will complement a large body of stories about the Armenian genocide. Our goal is not only to become a repository for such archives but also to make them easily accessible to scholars via digital publication on the website.

The Armenian Laboratory organizes seminars and conferences devoted to different topics of Armenian archaeology, ethnography, and history to raise awareness of and help preserve Armenian cultural heritage through dissemination of knowledge. Our first conference was devoted to current practices in the field of Armenian studies. Our second conference, held in October 2015, focused on Armenian–Iranian relations from prehistory to modern times. An upcoming conference will discuss advances in Armenian Archaeology in the past decade. Additionally, we seek to develop closer ties with the Institute of Archaeology and Ethnography of Yerevan, Armenia, by collaborating within the International Digital Ephemera Project—on a pilot study digitizing images of inscriptions



Kristine Martirosyan-Olshansky (foreground) and UCLA community members and supporters celebrate the donation of the Berekian family archives to the Armenian Laboratory on March 11, 2016.

of the Shirak region—and by cosponsoring a triennial conference on oral epic traditions, scheduled to focus next on the Armenian epic *Daredevils of Sasun*. A related project is the creation of an annotated English translation of the 15 earliest versions of this epic, which is full of mythological lore.

Assistant Director Kristine Martirosyan-Olshansky focuses her research on geochemical characterization and sourcing of Neolithic obsidian tools (circa 6000–5600 B.C.) from the site of Masis Blur. Obsidian is a volcanic glass that occurs abundantly in Armenia and has been identified as far south as Tell Mozan in Syria. Combining anthropological archaeology with scientific analytical methods, Kristine is exploring the origin of the raw materials used for these tools. Her research helps explain how far the Neolithic inhabitants of Masis Blur traveled to obtain obsidian and which sources they preferred, and it informs about prehistoric contact and exchange patterns in the region. Kristine has also been invited to study the obsidian assemblage from Karashamb, an important necropolis in Armenia that was continuously used from the Middle Bronze Age (2400 B.C.) through the Early Iron Age (900 B.C.). Currently the Armenian Laboratory houses a large collection of obsidian tools on loan from Armenia and a vast collection of obsidian samples from known southern Caucasus and eastern Turkish sources. Kristine can often be seen analyzing these beautiful stones and is always happy to show the collections and share her findings.

Additional information can be found at <http://armenianarchives.ss.ucla.edu/>.



## Ceramic Analysis Laboratory

Hans Barnard

The Ceramic Analysis Laboratory is housed in the Pasarow Mass Spectrometry Laboratory, directed by Cotsen affiliate Kym Faull. This facility is located on the sixth floor of the Semel Institute for Neuroscience and Human Behavior, opposite the Ronald Reagan Medical Center.

After a recent expansion of the Pasarow Laboratory, additional storage space and a dedicated bench were granted to Cotsen core faculty member Hans Barnard to facilitate and expand the analytical work that he and Faull have been cooperating on for several years (Barnard et al. 2007, 2011, 2016; Nigra et al. 2015). The expanded facility focuses on destructive ceramic analysis, including organic residue analysis and petrologic examination.

For the latter, the laboratory has all the equipment and consumables needed to prepare, study, and record petrologic thin-sections. Some of this material was previously owned by Michael Gottesman and was kindly donated to the lab by his widow, Sonia Gottesman. For the former, the laboratory has analytical instruments such as Thermo LC and Orbitraps, for identification and quantitation of components, and Agilent triple quadrupole LC/MS instruments for precise quantitative analysis. The laboratory also has a MALDI/TOF instrument, for laser ionization of samples, and an Agilent ICP/MS for elemental analysis, in addition to other analytical equipment.

An important component of the Ceramic Laboratory is the instruction of graduate and undergraduate students. This instruction is realized on an individual basis as part of research projects, such as students working on pottery from various excavation sites or organized in seminar settings, such as a lab class on mass spectrometric methods for archaeologists. Recent research projects include the study of organic residues in a number of sherds from the Persian Gulf region, from El Zotz in Guatemala, and from Tell Mozan in Syria. None of them, however, appeared to have preserved ancient organic remains. On the other



Cotsen graduate students Rachel Moy and Tao Shi prepare petrologic thin-sections of ceramic materials excavated by the UCLA archaeological project in Shire, Tigray Province, northern Ethiopia.

hand, a project investigating cacao residues (theobromine and caffeine) in pottery from the Classic Maya site of Copan in Honduras was more successful, as was a project identifying tobacco residues (nicotine and cotinine) in selected finds from San Nicolas Island in California. Petrologic thin-sections have been prepared from potsherds from the Vitor Valley, near Arequipa in southern Peru; from Mai Adrasha, near Indaselassie in northern Ethiopia; and from several Neolithic sites in central China. The laboratory welcomes new projects, collaborators, and students to make creative use of the available resources.

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# The Cotsen Laboratories



## Channel Islands Laboratory

Jeanne Arnold

The Channel Islands Laboratory is a place of continuous activity. The rhythm of lab work and research on multiple projects on the prehistory of the Santa Barbara Channel region, and more globally of complex hunter-gatherers, leads to a constant ebb and flow of graduate students and undergraduate volunteers. Much of the day-to-day analysis centers on sorting and identifying artifacts from ancient living floors and toss zones of Chumash villages. These objects provide a wealth of information concerning the daily lives of individuals from up to 1,500 years ago. The lab also hosts graduate students doing research on other regions and time periods.

Committed volunteers keep the lab buzzing. During the past three years, Alice, David, Sam, Renee, Maya, Paulo, Christian, Elizabeth, Marisa, and Julian have devoted a significant amount of their time to helping out. Our long-term volunteer Marillyn Holmes does everything: she sorts middens, connects the many students together, and makes the lab a wonderful place to work. Amber Madrid has contributed significant hours analyzing fishing tools—among the largest collections from the islands—as part of her graduate research at a nearby school.

The director of the lab, Jeanne Arnold, supports ongoing work on the origins of specialized craft production—including but not limited to shell beads and lithic microdrills—on Santa Cruz Island. Only 20 miles from Santa Barbara, Santa Cruz Island is completely undeveloped, and its archaeological record is unusually pristine. Specialization is just one of the ways that labor can come under control. Alongside ecological challenges and technical achievements, such as the plank canoe, specialization was a major element in the development of sociopolitical complexity among Chumash islanders. The research from this lab has been a critical source of data, enabling archaeologists to evaluate the origins of complex hunter-gatherers and their place in the development of human societies globally. Current graduate students Brian Holguin, Stephanie Salwen, Benjamin Shepard, and Scott Sunell study a wide range of topics united by research on processes surrounding emerging sociopolitical complexity without agriculture.



Graduate students currently affiliated with the Channel Islands Laboratory stand at the edge of Valley Anchorage on Santa Cruz Island. Left to right: Stephanie Salwen, Brian Holguin, Benjamin Shepard, and Scott Sunell.

Ben studies mortuary ritual and political displays of wealth during the transition from the Late Neolithic to the Early Bronze Age in the Cis-Baikal region of Siberia, Russia. His research has revealed changes in the ways political connections were forged during funerary events, providing a critical window into regional developments. Stephanie has investigated asphaltum (bitumen) used in the Santa Barbara Channel region and has developed a typology for adhesives, a difficult type of artifact. Scott's field projects over the past four seasons on Santa Cruz Island have yielded a good sample from the understudied late Middle period (A.D. 500–1150). Data sets from the sites he is testing have the potential to identify large-scale reconfigurations of labor in response to regional sociopolitical and environmental pressures. Brian is the newest member of the lab. He is currently working on multiple projects of Chumash material culture, including an analysis of artifacts made of *Tivela stultorum* (Pismo clam) from Santa Cruz Island and the evaluation of performance characteristics of a diverse lithic collection recovered during CRM work on the mainland.

Lab work is an essential part of archaeology. In fact, our many years of research on mostly later periods of the villages on Santa Cruz Island show that every hour we invest in field recovery will generate about 15 hours of lab work. Because we screen all soils, bring all screen residues back to campus, and meticulously sort these in the lab, we can tell a much richer story of the environmental changes and emerging specializations of the islanders. The Channel Islands Laboratory has provided and continues to provide students with hands-on opportunities to acquire experience and to be a part of active research in southern California.



## Classical Laboratory

*John K. Papadopoulos*

The primary project of the Classical Laboratory continues to be the Ancient Methone Archaeological Project, a collaboration of the Ephoria of Antiquities in Pieria (Greek Ministry of Culture) and UCLA, under the auspices of the American School of Classical Studies at Athens and codirected by Manthos Besios, John Papadopoulos, and Sarah Morris. In 2015 excavations at ancient Methone continued on the West Hill, or acropolis, in four trenches opened in 2014 and two new trenches, in an area identified as Archaic and Classical workshops over an Early Iron Age settlement that cut into Bronze Age graves. In the earliest remains at the site, four additional prehistoric graves appeared. Two of these (Tombs 17 and 18) were cut into bedrock for two extended inhumations, with grave goods including local Mycenaean vessels, bronze weapons, and bone jewelry dating to the Late Helladic IIC period (circa 1200 B.C.), an extension of the cemetery previously excavated here by the Ephoria. Two additional disturbed burials in contracted position, without surviving grave goods, possibly belong to the Early or Middle Bronze Age.

In the northernmost sector, the oldest sequences thus far encountered belong to the Early Iron Age, before the colonization of Methone by Eretria in the later eighth century B.C., when this became an industrial area. In its later Archaic phase, the area was dense with the remains of metalworking and other industrial activity. It suffered the same destruction by fire in the mid-sixth century B.C. that was identified across the West Hill. Excavation of this sixth-century

Figure 2. Brian Damiata conducts geophysical survey at Methone in 2015. (Photograph by John Papadopoulos)



Figure 1. A Corinthian plate found in Methone. (Photograph by Ian Coyle)

destruction horizon in other areas of the site yielded additional fragments of imported vessels, such as a Corinthian plate (Figure 1), previously excavated by the Ephoria.

Finally, in the southern area of the West Hill, Archaic and Classical levels (seventh to mid-fifth century B.C.) just below the surface represent industrial contexts (workshops with temporary roofing and outdoor working spaces, kilns, and metalworking hearths). Nearby, a pit uncovered in 2014 continues to yield debris from the 354 B.C. destruction of the site by Philip II, father of Alexander the Great, who lost his right eye in the siege of Methone. The pit, excavated to a depth of 3.5 m in 2015 (and more than 6 m in 2016), yielded a valuable assembly of material from the unexcavated domestic areas of Archaic and Classical Methone.

After an initial season testing different geophysical methods, frequency-domain electromagnetic techniques were applied to the area of geomorphological coring, where preliminary results in 2015 indicate a compacted road-like surface next to a possible fortification wall, presumed to be part of the ancient harbor of Methone (Figure 2). At the same time, an intensive campaign of data captured through terrestrial LIDAR covered a wide area of ancient Methone and its environment. This produced an initial bare-earth surface model as a baseline for further studies of the ancient topography through geomorphology. The geophysical survey of Methone is conducted by Brian Damiata, the LIDAR survey is directed by Robert Kayen, and the geomorphological project is spearheaded by Nancy Krahtopoulou and Jonathan Turner.



# The Cotsen Laboratories



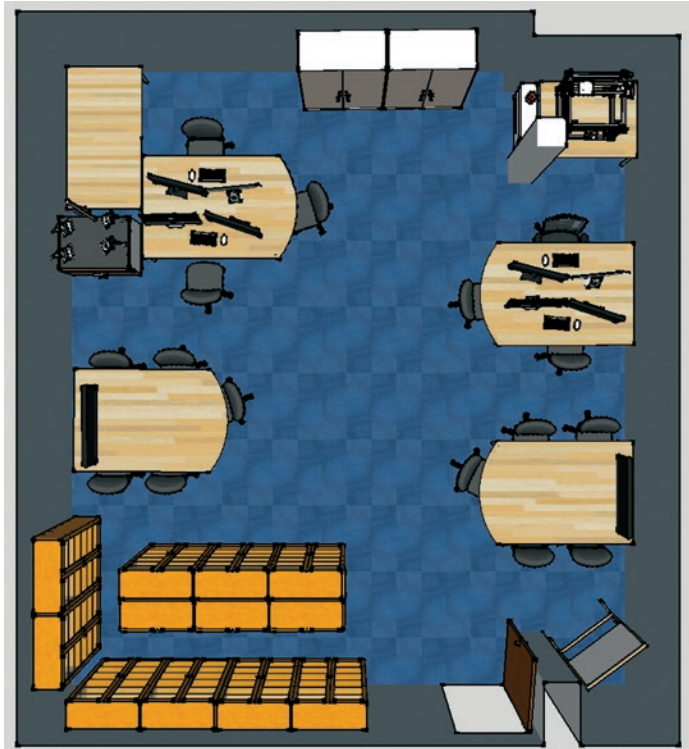
## Digital Archaeology Laboratory

*Deidre Whitmore*

The goal of the Digital Archaeology Laboratory (DAL), established in fall 2016, is to support the technological needs of Cotsen faculty, students, and staff by providing facilities, advice, and training. DAL is located in A163—formally home of the Cotsen Institute of Archaeology Press—and is managed by Deidre Whitmore. In addition to managing the lab, Deidre is working on a data-publishing platform for the press and is conducting research on archaeological data management. Tyler Lawrence, technology analyst of the Cotsen Institute for eight years, will also be based in DAL.

DAL is equipped with two powerful computers with the hardware and software required to build and render intricate three-dimensional models and environments, run complex statistical analyses on large data sets, and geospatially reconstruct and analyze archaeological and cultural sites. Each workstation is outfitted with a high-resolution monitor and is available to all Cotsen affiliates. In addition to the workstations, DAL has three collaborative “pods,” designed for working in small groups. Each pod is equipped with a large screen mounted to a wheeled stand so that users can plug in and share the screen with the group or take advantage of a second display while working. The pods can be rearranged to accommodate larger meetings or workshops.

DAL also provides scanning and printing equipment, including a 3D printer that can be used to create custom-fitted supports for objects, reproduce or reconstruct artifacts, print instructional tools for students, or build site models for exhibitions or demonstrations. A digital imaging station can be used to photographically scan a variety of media, including large maps, photographic prints and negatives, and



A three-dimensional model of the Digital Archaeology Laboratory as envisioned when Backdirt went to press.

books. The station has a built-in light box for photographing transparent media and adjustable mounted lights for creating optimal conditions for capturing opaque media. The same station can be utilized for photographing objects to create structure-from-motion models.

DAL will host workshops, bringing in experts from across campus to address challenges arising in archaeological practices. We also offer one-on-one and small-group consultations on data management and preservation, building an online portfolio, and a variety of other topics. A full list of resources offered by DAL is available on the Cotsen Institute website.

The vision for DAL is to grow into a space in which users work together to perform research and create a community of practice where assistance and inspiration can be found and experimentation is encouraged. DAL is part of a growing campus-wide network of collaborative spaces—including the Sandbox (in the Mathematical Science Building) and the Scholarly Innovation Laboratory (in the Young Research Library)—and will help integrate archaeology into the many digital initiatives and the broad knowledge base available and rapidly increasing at UCLA.

Additional information can be found at <http://www.ioa.ucla.edu/labs/dal/>.

# The Cotsen Laboratories

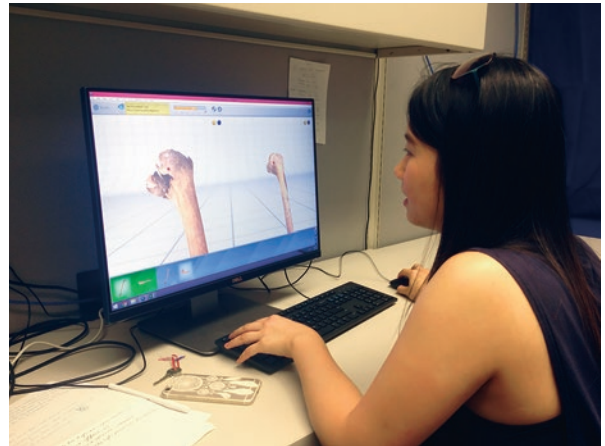


## Digital Bioarchaeology Laboratory

*Mauricio Hernandez*

The main aim of the Digital Bioarchaeology Laboratory is to enhance the research experience of undergraduate students by exposing them to cutting-edge research approaches. In 2016 we have been exploring different methods by which human skeletal remains can be digitized in a way that preserves their research potential for osteometric analysis as well as paleopathological diagnosis. The use of virtual study specimens has become more commonplace in scientific research, as such specimens offer more precise depictions than drawings or photographs. High-quality three-dimensional models can be useful for teaching in large lecture halls or small computer laboratories, and they are essentially permanent archives for fragile organic materials that decay over time or wear from repeated handling. Several organizations and universities, such as the Turkana Basin Institute, the Max Planck Institute, the Swiss Institute Medical Repository, and Bradford University, have created open-access digital libraries of anatomical specimens, allowing everyone to benefit from these technologies.

To test which method produces the most accurate models, our undergraduate research volunteers have been comparing inter- and intra-observer errors in measurements taken from both real and virtual skeletal elements from a sample of human bones previously curated at the Fowler Museum of Natural History and which have since been repatriated. The first three-dimensional capture method utilized a NextEngine laser scanner to record surfaces and features on a platform that automatically moves to offer a 360-degree perspective on an object. The second method employed Agisoft PhotoScan structure-from-



Undergraduate research volunteer Ying-Tung Cheng uses ScanStudio to align two femur scans by placing matching points along their surfaces.

motion software to create scaled models from high-quality digital photographs.

It is important to note that although digital models offer many advantages, creating them is not a straightforward task, and various conditions need to be met to obtain useful prototypes. First, the quality of the model strongly depends on the shape and size of the bone to be scanned, the type of lighting, and the number and quality of photographs in the case of structure-from-motion. Taphonomic issues, such as soil type coloring the bone, erosion, and weathering, affect the specimen being digitized and thus the final product.

Thanks to a generous grant from the Cotsen Institute to purchase the required software and a Dell Precision workstation—with a 3.50-GHz Intel Xeon processor and 64 GB of RAM—our research volunteers have been busy measuring, photographing, and scanning long, flat, and irregularly sized bones. They have amended the initial models, integrated chunks of models scanned or photographed from different angles, aligned them, and refined the results. We are now in the process of taking virtual measurements with Rhino 3D, a computer-aided design software at the Technology Sandbox, part of the Institute for Digital Research and Education, to compare them with measurements taken from physical specimens. As the rendering of three-dimensional landscapes and computer-aided design are already important tools in archaeology and many STEM fields (science, technology, engineering, and mathematics), the experience attained in the Digital Bioarchaeology Lab provides undergraduate students with a skill set that will serve them well in their future careers.





## East Asian Laboratory

*Tao Shi, Chenghao Wen,  
Lothar von Falkenhausen,  
and Min Li*

The East Asian Laboratory serves as the center for research on archaeology in China, Korea, Japan, Mongolia, and Southeast Asia at UCLA. The lab is directed by Lothar von Falkenhausen, professor of art history and former associate director of the Cotsen Institute, and Min Li, associate professor of anthropology and of Asian languages and cultures. It is the largest research unit dedicated to East Asian archaeology on the West Coast, if not in the whole country. Although its principal partners so far have been in China, the lab is open to collaboration with archaeologists and institutions from all East Asian countries. The growth in East Asian archaeology at UCLA has been supported by a 2007 Institutional Enhancement Grant from the Henry Luce Foundation, which allowed the university to expand its faculty, recruit graduate students, invite visiting scholars and postdoctoral fellows, organize conferences, and support field research in East Asian archaeology.

Since its founding in 1993, the lab has been involved in several archaeological projects in East Asia, and lab-affiliated faculty have been instrumental in enhancing the impressive list of East Asia-related publications of the Cotsen Institute of Archaeology Press. From 1999 to 2004, the lab was a partner in a joint UCLA–Peking University project on landscape archaeology and ancient salt production in the Upper Yangzi River basin. Two UCLA PhD dissertations, by Rowan Flad and the late Pochan Chen (1973–2015), resulted from this project. The results of the salt archaeology project have been published in three bilingual volumes of essays coedited by Li Shuicheng and Lothar von Falkenhausen and published by Science Press (Kexue Chubanshe) in Beijing.

The lab has an ongoing collaborative research project on landscape archaeology in Qufu (Shandong), and preparations are under way for a project in Henan Province. Since 2010 members of the lab have taken a leading role in the International Archaeological Field School at Yangguzhai, the first such endeavor in China, conducted in collaboration with various institutions in Shaanxi Province. This annual five-week program has been highly successful in providing



Graduate student Ellen Hsieh hard at work in the East Asian Lab.

training opportunities for undergraduate and graduate students from UCLA and other institutions. Several articles and at least one MA thesis (at the University of Arizona) have been based on data from the Yangguzhai field school. Li Min and his team are publishing results from the Qufu landscape survey project in *The Holocene, Archaeological Research in East Asia*, and other journals. Min Li's trailblazing *Social Memory and State Formation in Early China* is currently in production with Cambridge University Press.

Doctoral students associated with the East Asian Laboratory have conducted their own projects in a variety of places, covering many different periods. To mention three recent examples: Adam Smith (now teaching at the University of Pennsylvania) studied divination records from Anyang from the late second millennium B.C.; Kuei-Chen Lin (now at Academia Sinica in Taiwan) studied the local economy of the Chengdu Plain in southwestern China during the Bronze Age; and Jack Davey (currently at UC Berkeley) explored the relationship between mortuary ritual and social development in Iron Age Korea. In 2015 research activities under the auspices of the lab were enhanced by the addition of the first Cotsen postdoctoral fellow in East Asian archaeology. Mauricio Hernandez, working on skeletal remains from northwestern China, made use of his time at UCLA to teach classes and publish a series of papers on his research.

Five graduate students are currently doing research under the auspices of the East Asian Lab. Ellen Hsieh's topic is cultural contacts and hybridity in Manila (Philippines) during Spanish colonial times. Hsiu-ping Lee focuses on the Erlitou culture of the Central Plain of China, commonly associated with

# The Cotsen Laboratories

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## East Asian Laboratory *(continued)*

the Xia legacy—the first dynasty in Chinese historiography. Richard Ehrich is trying to identify different traditions of ceramic production in the Middle Yangzi River region during the Late Neolithic and Chalcolithic ages in the fourth and third millenniums B.C. Chenghao Wen's research field is northwestern China and the Eurasian steppes, where he has embarked on a dissertation project on interactions between the Chinese heartland and Central Asia during the second millennium B.C. Tao Shi focuses on the Neolithic period in the Chinese heartland. His research project is about the interaction between central and northwestern China and its contribution to the emergence of early states in the Central Plain.

Although the lab does not have a permanent collection of objects, it curates a large collection of declassified Corona satellite images of China. With the Center for Advanced Spatial Technology at the University of Arkansas, these will be geo-corrected for archaeological use and a digital humanities project on Chinese archaeology. As a service to the academic community, the lab has been housing a large number of visiting scholars from China and other East Asian countries. Their time at the Cotsen Institute has helped them develop a comparative perspective to their own research and has brought new insights both to the classroom and to graduate research at UCLA. The lab has also hosted several conservation scientists, whose work has helped members foster closer collaborations with conservation programs at the Cotsen Institute and the Getty Conservation Institute. The lab was also involved in the organization of the international conference *Cave Temples of Dunhuang: History, Art, and Materiality*, held at the Getty Center and at UCLA on May 20–21, 2016, and it assisted the new director of the Cotsen Institute, Willeke Wendrich, and core faculty member Hans Barnard with their visits to China (to Chengdu and Wuhan, respectively) in the summer of 2016.

Finally, members of the lab are actively engaged in outreach toward East Asian communities in Los Angeles in collaboration with UCLA's Center for Chinese Studies. As Chinese archaeologists are becoming more internationally active, this is another tremendously exciting prospect. In collaboration with the Institute of Archaeology of the Chinese Academy of Social Sciences, a regular flow of Chinese archaeologists will be invited to present their research at UCLA and within the framework of community outreach.



## Egyptian Laboratory in the Museo Egizio

*Caroline Arbuckle MacLeod and Willeke Wendrich*

Archaeological research questions are not necessarily addressed only by fieldwork; the study of museum collections can provide important information as well. Working with well-excavated, stratified materials at the same time adds to the understanding of museum collections, which often date to the late 1800s/early 1900s and are usually poorly provenanced. Museum studies are a vital component of archaeology, and many aspects of material culture are better studied via large collections in climate-controlled basements than through site-specific recording out in the desert sun. The objects in museums that remain unpublished invite a different type of excavation and create opportunities for archaeologists and anthropologists to uncover understudied collections.

In the summer of 2016, a small team from the Cotsen Institute of Archaeology traveled to the famous Egyptian Museum (Museo Egizio) in Turin, Italy, to start several long-term projects. Faculty members Willeke Wendrich and Hans Barnard, along with graduate students Caroline Arbuckle MacLeod and Vera Rondano, spent several weeks analyzing objects and preparing for a museum field school. The Museo Egizio has an enormous collection of Egyptian artifacts, partly from documented excavations in the early twentieth century. Under a new director, Christian





Figure 1. Willeke Wendrich and Caroline Arbuckle MacLeod examine objects from the famous Tomb of Kha and Merit.

Greco, the museum was recently remodeled and reorganized, with a much stronger focus on collaborative research. The museum's curators and conservators opened their doors to the Cotsen Institute to assist in the immense task of revealing the collection to the rest of the world.

In many countries, archaeologists can send samples to different labs for analysis, such as radiocarbon dating, stable isotope analysis, or mass spectrometric research. For decades, however, Egypt has rarely allowed samples to be exported. The UCLA team, with assistance of the museum staff, is currently formulating requests for sampling to carry out radiocarbon and wood anatomy analyses that would be impossible to do in Egypt. This summer the team used UV lights and a portable X-ray fluorescence spectrometer to study faience, basketry, and the decoration on Egyptian coffins.

Caroline Arbuckle MacLeod's thesis research focuses on the social and economic context of wood-working technology, using Egyptian coffins as a case study. She spent her time in the museum examining ancient coffins. The vast collection enables a diachronic and regional assessment of technological change through a study of construction, joining techniques, and tool marks. Vera Rondano studied the composition of Egyptian faience in mummy nets and *shabti* figurines to assess whether different workshops created objects that show similarities in style and production method. The museum staff and the *soprintendenza*, the office responsible for the objects, have been enthusiastic supporters of the research and have allowed the team to carry out an array of analyses.

Next summer the team will return to the Museo Egizio to continue research and will also participate in a visualization project in cooperation



Figure 2. UV lights are used to view phenomena invisible in natural light.

with the Polytechnic University of Turin, as well as a museology field school offered through the Institute for Field Research. Students in this school will work hands-on with ancient objects to gain knowledge from them. They will also get information on aspects of museology, such as collections management, documentation, research, and care, as well as preservation, creating exhibits, and visitor relationships. The memorandum of understanding between the Cotsen Institute and the Museo Egizio not only specifies research on collection but also opens possibilities to jointly create exhibits and grant loans to museums in the Los Angeles area. The arrangement provides students and faculty with access to an incredible collection of ancient Egyptian material culture, considered second in the world after the Egyptian Museum in Cairo.



## Mesoamerica Laboratory

*Richard G. Lesure*

In the sixteenth century, at the time of the Spanish conquest, Mesoamerican peoples spoke many, often unrelated languages. But as a result of more than 3,000 years of intensive contact, they shared a wide variety of beliefs and practices. Research in the Mesoamerica Laboratory examines the deep history of these contacts. Emphasis is on the Formative era. This period of more than two millennia, from around 1900 B.C. through A.D. 200, was one of momentous change in Mesoamerican societies. It began when nomadic hunter-gatherer-horticulturalists adopted pottery and settled for the first time in permanent villages. By the end of the Formative era, Mesoamerica was characterized by fully urban civilizations. Teotihuacan was poised to become the sixth largest city in the world.

Three collaborative research projects concerning the Formative era are currently under way in the Mesoamerica Laboratory. One examines subsistence on the Pacific coast of Chiapas, Mexico, during the first part of the Formative era, roughly 1900 to 1000 B.C. The collaboration in this case is with Tom Wake, director of the Zooarchaeology Laboratory. A large collection of animal bones spanning the first millennium of the Formative era is in the final stages of analysis. The topic of interest is how diets changed with the emergence of settled villages. The coast of Chiapas is noteworthy for the great variety of wild foods available, in particular the abundant fish of the coastal estuaries. Preliminary results indicate a gradual reduction in the diversity of animals consumed, with greater emphasis on a narrowed range of species. At the site of Paso de la Amada, the fish consumed became smaller over time, suggesting that human consumption was putting a strain on the local ecosystem.

Whereas the first project is a focused study of changing subsistence in one region of Mesoamerica, a second project concerns the nature of the transition to the Formative era at a much larger scale. The collaboration in this case is with Greg Schachner, director of the Southwest Lab, and several graduate students interested in both the Southwest and Mesoamerica. We are studying the demographic impacts of the transition to agriculture from southwestern North America to lower Central America. One goal is to place Mesoamerica in a wider context. We know that Mesoamerica stood out demographically from surrounding regions at the time of the Spanish conquest. It was



Fragments of pre-Olmec effigy pots from the coast of Chiapas, Mexico, 1500–1300 B.C. At the top is a dog; the image below probably represents a sea turtle.

characterized by dense populations in urban states. To the north and south were less densely settled regions. When did Mesoamerican societies begin to stand out from their neighbors? Our preliminary results, presented at the 2016 Annual Meetings of the Society for American Archaeology in Orlando, indicate that the Middle Formative period, from 1000 to 400 B.C., was crucial in ancient Mesoamerican demographic history. The particular demographic characteristics of Mesoamerica compared to other regions can be traced to the rapid population expansions of that era.

The third project returns to the coast of Chiapas, but the topic is art rather than diet. The goal is to develop an online database to make available a remarkable corpus of modeled ceramic imagery dating from the first millennium of the Formative era. The collection has more than 5,000 fragments, including human imagery on figurines and masks and animal imagery on effigy pots and whistles. This NEH-funded project draws on excavations made over the last 30 years. The collection is particularly important because it extends back to the very beginning of the Formative era. Our pooled sample of images dating prior to 1400 B.C. is larger than extant collections from any other region of Mesoamerica. We also have a stunning set of Olmec-style figurines from the period 1400 to 1200 B.C. Our research topics are ambitious. This rich corpus of imagery allows us to ask questions about the genesis of Mesoamerica itself.





## Mesopotamian Laboratory

Giorgio Buccellati and  
Marilyn Kelly-Buccellati

“The many faces of archaeology”—this phrase best describes our recent work in the Mesopotamian Laboratory. Archaeological research has led us on many different paths, and external circumstances have sharply conditioned our approach to the site of Tell Mozan (ancient Urkesh) and to archaeology in general. In some ways, they are faces of a future we had foreseen, a future that is here now. It has been brought harshly into focus by the tragic events that have affected Syria over the last five years. Syria of the fourth to second millennium B.C. was our main focus. It still is. But this Syrian past is now deeply embedded in a very contemporary Syrian present. Our lab is the hub for these developments, which are making our project and our approach to archaeology models of their kind.

### THE DIGITAL INVENTION OF URKESH

Forced absence from direct fieldwork has made the lab the locus of invention more than ever before. We have a server dedicated to our projects for our staff in Syria, of course, but it also links together researchers on three continents. Believe it or not, in spite of all the difficulties, after five years of war, we still have four young men and women directly linked with the server in the lab (even though at one point ISIS was only 60 km from Tell Mozan). A ceramic analyst trained by Marilyn Kelly-Buccellati has processed more than 60,000 sherds from previous excavations. The tabulated ceramic records are sent over the Internet—which still works, if intermittently—to a staff member in Damascus, who organizes them and sends them on to the server.

Working not only on these new data but also on those analyzed in earlier seasons, Marilyn is producing a first: a digital book on ceramics that combines the data with a fully developed interpretation and discus-



Figure 1. Conservation work on the monumental staircase of the Great Temple of Urkesh in Tell Mozan takes place every fall in preparation for winter. This image, taken in October 2015, shows local men and women placing fresh mud mortar to protect the joints between stones.



Figure 2. In May 2016 students from the nearby city of Hassaka visited Tell Mozan. Here they greet us from the steps of the monumental staircase. Hassaka has been a point of conflict in Syria.

sion. It is part of the Urkesh Global Record, a comprehensive website that represents a new approach to digital publishing. The philosophy behind this project is presented at length in a book by Giorgio Buccellati, to be published by Cambridge University Press in the coming months. Entitled *A Critique of Archaeological Reason*, the book makes ample reference to the Urkesh website to exemplify the theory that deals with the principles applied in our excavations.

All this requires extensive grant support. Besides undergraduates and two IT specialists, a number of postdocs and students work on our projects. In the recent past, they included Alda Agolli, now teaching in Albania (we supported her during her transition period), and Alice Mandell, who just started a tenure track position at the University of Wisconsin. (Giorgio is working with her on a book planned for submission

# The Cotsen Laboratories

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## Mesopotamian Laboratory *(continued)*

in September 2017.) In recent years, two postdocs have come to the lab from Europe, and several more work in direct contact with us. We expect to have funding in the coming years for more postdocs and UCLA students.

### THE STAKE OF THE STAKEHOLDERS

Community archaeology was at the heart of our project long before the term became a catchword in the discipline. The war has put “our” community to the test, very severely. And, difficult though the whole experience has been, we have passed muster. The lab, with its server, is at the heart of this development. It serves as our “war room,” from which we monitor conservation of the site and continuing local interest in it. The conservation program is the essential starting point. A strong commitment to preserve the site was our policy when we could return each year to monitor the effects of the winter weather. It is more than ever our policy today. After a five-year hiatus, the architecture—both mudbrick and stone—is in excellent shape. Three men monitor the site closely year-round and give us detailed reports at least once a month. The Internet feeds all this information back to our “home.” The website on the lab server documents all this, and Bill Orrange (a volunteer with and donor to the Cotsen Institute) works on registering the photographic record, with more than 10,000 images received from Tell Mozan since the beginning of hostilities.

### THE OUTER FERTILE CRESCENT

From the beginning of our scholarly involvement, we have been interested in the region north of the Syro-Mesopotamia heartland—including modern Georgia, Armenia, and Azerbaijan—which we call the Outer Fertile Crescent. Marilyn wrote her dissertation on this area and remained connected to Georgia over the years. At one point we considered excavating in Shida Kartli, the central valley of Georgia. We were not able to carry out this plan, but unable to return to Tell Mozan later, Marilyn returned to fieldwork in Georgia with a team from the University of Venice. Her work there has involved the highest levels of local cultural institutions, from the president of the Georgian Academy of Sciences to the director of the National Museum. The Cotsen Institute has generously provided some funding for the projects in Tell Mozan and Georgia.



## Molecular and Nano Archaeology Laboratory and the Archaeomaterials Research Group

*Ioanna Kakoulli, Christian Fischer,  
and Sergey Prikhodko*

At UCLA, a collective effort toward systematic investigations and conservation of material cultural heritage is spearheaded by the Molecular and Nano Archaeology (MNA) Laboratory and the Archaeomaterials Research Group (ARG). This interdisciplinary endeavor at the interface between archaeology, materials science, and engineering falls under the following three categories:

**Archaeometry:** integrating the scientific analysis of material culture to understand ancient technology and craft specialization, socioeconomic systems, and interregional and transregional trade in antiquity. This work entails combining principles from the natural sciences with reverse-engineering processes from the material sciences and research methods from the social sciences.

**Conservation science of material culture:** studying the relationship between microstructure and properties and understanding the kinetics and mechanisms of alterations induced by anthropogenic and environmental processes to (a) determine suitable conservation treatments and (b) design new conservation-suitable materials.

**Forensics of material culture:** collecting and analyzing physical evidence in the field and in the laboratory using advanced technologies and methods to aid law enforcement investigations of artifacts that have been looted or are of questionable origin.

Researchers in ARG and the MNA Laboratory apply state-of-the-art field-deployable and laboratory-





Upper row from left: Ioanna Kakoulli, Christian Fischer, and Sergey Prikhodko, codirectors of the Molecular and Nano Archaeology Laboratory and the Archaeomaterials Research Group. Bottom row from left: scanning electron micrograph of a hummingbird back feather; late-twelfth-century Bayon-style Cambodian sculpture; scanning electron micrograph of radial growth of an iron manganese phosphate-rich encrustation on a stone sculpture; and detail of a late classical marble painting (circa 340 B.C.).

based imaging and spectroscopic techniques (including X-ray and Raman spectromicroscopies and electron microscopies) for the analysis of material culture, from the macroscopic to molecular and nano-length scales, to identify chemistry, microstructure, properties, and engineering processes of archaeological and ethnographic materials, and to monitor change. The lab developed an analytical protocol using primarily nondestructive techniques (where samples are not consumed by the analysis and can be reused), allowing for the analysis of specimens—both organic and inorganic—without altering their original morphology and structure. This approach has enabled endeavors into exciting research projects and has yielded major new discoveries, leading to a number of peer-reviewed scientific articles.

Research conducted by ARG and the MNA Laboratory reflects material culture in various forms—stone, ancient paintings, ceramics, glass, glazes, and textiles—from all over the world. This research not only pushes the boundaries on what we understand about the materials but also advances methods of investigation. Research topics pursued by students and faculty of the MNA Laboratory include the chemistry and properties of ceramic pigments such as Egyptian blue, Chinese blue, and cobalt blue; the technology and provenance of Chinese and Japanese blue-and-white porcelain; the technology and trade of colonial glass from Mexico; pre-Angkorian sculptures from Cambodia, Vietnam, Laos, and Thailand; on-the-fiber dye analyses using surface-enhanced Raman spec-

troscopy; inorganic mineral treatments based on in situ formation of hydroxyapatite for the consolidation and protection of archaeological wall paintings; and imaging spectroscopies and chemical sensing based on hyperspectral imaging and terahertz technologies for noninvasive studies of multilayered and heterogeneous cultural materials. ARG collaborates closely with the Getty Antiquities Conservation Department for the characterization of Greco-Roman funerary portraits, with the National Autonomous University of Mexico and the Fowler Museum for the study of Jaina-style figurines, with the Moore Laboratory of Zoology at Occidental College for the study of structural colors in Mexican bird feathers, and with the Department of Homeland Security and the FBI for the authentication and repatriation of looted archaeological artifacts.

Additional information can be found at <https://archaeomaterialsgroup.wordpress.com/>.

# The Cotsen Laboratories



## An Ottoman-Era Laboratory for Archaeology in Jaffa

*Aaron A. Burke*

While many excavations carry out laboratory analysis at home institutions, a number of nations do not permit the removal of artifacts from the country. Among these is Israel, and for this reason, we at the Jaffa Cultural Heritage Project (JCHP) have made arrangements to analyze excavated material on-site. Since 2007 our base of operations has been the rooftop storerooms of the Jaffa Museum of Antiquities, which was founded in 1961 but has been largely closed to the public since 2006. The gradually decomposing sandstone walls of this Ottoman-era building—lacking in air-conditioning and humidity controls—enclose a space that has become vital to the processing of archaeological artifacts from both past and present excavations in Jaffa. In this way, JCHP has followed in the footsteps of the late Jacob Kaplan, who started excavations and established the museum when he was the municipal archaeologist of Tel Aviv and Jaffa. Many years have been invested by staff members laboring in this space.

Since the start of our own work, the space has played a vital role by allowing us not only to study previously excavated artifacts but also to subject them to a wide array of data capture and analyses. By establishing an Internet connection on the roof and connecting iPads to computers in Los Angeles via mobile networks, we have retrofitted the space, with minimal effort and investment, to suit the needs of a twenty-first-century archaeological research project. Internet



Undergraduate student Stacy Miller (UCLA), left, and graduate student Martina Haase (Johannes-Gutenberg University, Mainz), right, sift for beads at the rooftop laboratory of the Jaffa Cultural Heritage Project.

connections permit us to access an online, multiuser database in the United States (called OCHRE) from workstations and iPads as we comb the storeroom shelves for artifacts and the remains of pottery buckets among tattered boxes of ceramics from as early as the 1950s.

At the museum, we have conducted a wide range of analyses on finds from Jaffa. Project staff and participants collect basic data for artifacts and enter it online. Ceramics and small artifacts are photographed and subjected to 3D scanning to produce profile drawings. A number of samples are extracted from artifacts in the museum for further analysis outside Israel. Among these are ceramic samples for residue analysis, botanical analysis, and petrography, as well as organic samples for radiocarbon analysis. Such sampling aims to provide insights into local diet and cuisine, in particular that associated with the Egyptian New Kingdom garrison under investigation. We have achieved many significant findings because of this on-site laboratory. There is much excitement in fieldwork, but the most significant findings are routinely made days, weeks, months, and even years after finds have been excavated.





## Rock Art Archive

Jo Anne Van Tilburg and Sebastian Waz

Rano Raraku was the main quarry for the iconic statues (*moai*) of Easter Island (Rapa Nui) and is now a national park administered by the Corporación Nacional Forestal. It is a circular volcanic landform about 50 m above sea level and part of a large basaltic plain that originates from Ma'unga Terevaka, one of three volcanoes on the island. From 2002 to 2014, our research team created digital maps of the Rano Raraku Interior Region and excavated several statues and associated features (Figure 1).

The embellishment of three-dimensional *moai* with rock art has provided a unique analytical opportunity. The analysis we conducted on the *moai* RR-001-156 (known as “Papa”; Routledge and Routledge 1914:190) and RR-001-157 (“Papa’s Wife”; Routledge and Routledge 1914:190) had two components: recording the location of decorations and describing the motifs. Our purpose was to build a



Figure 1. The excavation of Papa (Moai RR-001-156), with project codirectors Jo Anne Van Tilburg and Cristián Arévalo Pakarati.

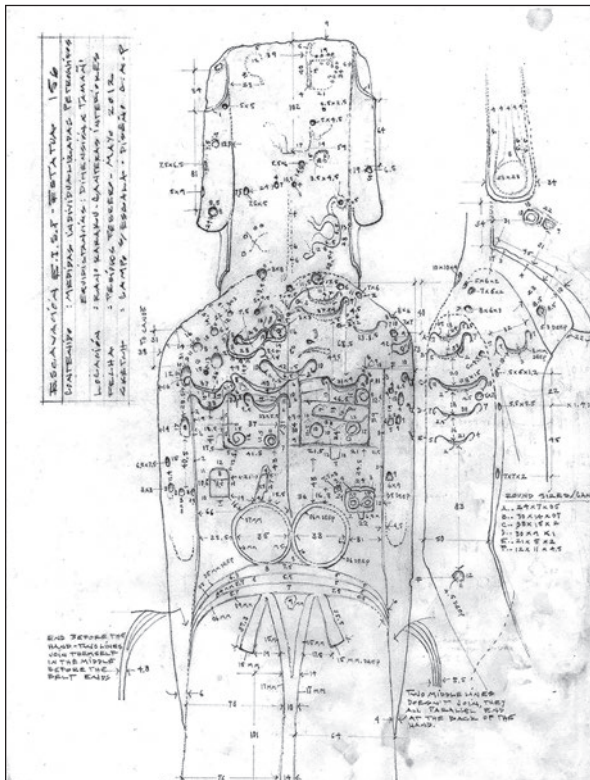


Figure 2. Embellishment locations sketched onto a drawing of Papa (Moai RR-001-156).

robust database in which rock art on megalithic stone sculpture can be described and queried. As they are the most heavily embellished objects within the Rano Raraku quarry, Papa and Papa’s Wife served as useful prototypes, allowing us to extend our method to other objects. Due to limitations imposed by the walls of our excavations, photographs and videos of the exposed surfaces were difficult to capture. Measured drawings of Papa and Papa’s Wife, prepared by codirector Cristián Arévalo Pakarati, instead provided the reference data for our analysis (Figure 2).

First we established distinct surfaces and design fields on each statue. We considered a number of issues, including the practicality of hemisphere-oriented versus face-oriented labeling, the specificity of the decoration to the location, and the potential for observer’s bias. Ultimately we decided that a face-oriented labeling system would work best for these and other anthropomorphic objects, as the placement of ornamentation appears to relate strongly to the defining features of the objects. Moreover, these bodily features are clearly and unambiguously identifiable.

The second step of our analysis was to identify individual embellishments, as recorded in our refer-

## Rock Art Archive *(continued)*

ence sketches. These sketches were digitally traced using Adobe Illustrator; the fill color corresponded to our classification of the motif. The least ambiguous and most easily defined motif, present on both Papa and Papa's Wife, was the cupule: a small circular hollow. Cupules with well-defined dimensions were traced in yellow and numbered from head to base; those on the left and right sides each constituted different sets. In the case of Papa's Wife, one cupule was on the medial back. It was interpreted as separate from the left and right sets and was numbered 0. This left-right distinction was reflected only in our nomenclature and was not included as information capable of being queried. A similar process was conducted for crescent motifs. During this process we recognized ambiguities in our delineation of various crescent forms, which we hypothesize to be figural motifs, from the motif defined as a canoe (*vaka*). These ambiguities were resolved by developing new, nuanced definitions for various types of crescent motifs. The viability of this taxonomy is still being tested. Miscellaneous figurative motifs include the birdman (*tangata manu*) and anthropomorphic facial forms (*make-make*). These were traced and labeled according to our expanding taxonomy.

The information generated by this analysis was imported into a database that, among other things, tabulates megalithic stone sculptural objects on Easter Island and their ornamentation. This information has been integrated into a geospatial database, allowing us to establish relationships between embellishments, objects, and their locations. Thus the frequency of these relationships across Rapa Nui may be examined. Exploring and interpreting this new data set is the work now ahead of us. As we extend our analysis to other areas of Rapa Nui, we will update our motif labeling taxonomy to make it more comprehensive, descriptive, and objective. As this system of analysis is overlaid on a larger swath of objects, we hope to gain insights into the nature of rock art and its role in ancient Rapanui society.

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## Legacy Data in Room 418: A Cautionary Tale

*Ernestine S. Elster*

Grotta Scaloria is a double-chambered cave in southeastern Italy with an impressive array of cultural materials from the mid-sixth millennium B.C.E. It has become the Cotsen Institute's poster child of "legacy data." The excavations in the cave in 1978–1980 were important, yes, but never fully published. What happened is archaeology's not-so-secret embarrassment and this cautionary tale: excavation and no publication.

In Scaloria's case, the distinguished codirectors, Marija Gimbutas (UCLA) and Santo Tiné (University of Genoa), both now deceased, distributed data sets among their students and colleagues from the United States, Italy, Hungary, and Great Britain while themselves turning to other challenges. Notes, letters, maps, and manuscripts, as well as drawings and photographs of the excavation, the team, pottery, bone and stone artifacts, human skeletal parts, and so on, were thus widely dispersed and virtually abandoned by the principal investigators. Toward the end of her life, and addressing me, Marija declared, "You must see to it that Scaloria is published." I promised, but I did not focus on the challenge, even though I knew that one banker's box holding my 1980 notes and slides would barely require writing a single chapter.

Enter now John Robb, an important character in this cautionary tale, who had a field project in southern Italy and a research interest in human skeletal remains. "The Italians expect you to publish Scaloria," John said, "and I will help you in any way I can." His





The old entrance into Scaloria Cave in 1980.

very prescient offer led to our forming the Save Scaloria Project (SSP), based in Room 418 of the Cotsen Institute. With John's introduction I met Santo Tiné in Genoa in 2008, and though wheelchair-bound, he was most encouraging and eager to help. He immediately invited two Italian archaeologists, Eugenia Isetti and Antonella Traverso, who had worked with him and Gimbutas in 1978 and 1979, to join the team. With Tiné on board, the SSP was assured access to Scaloria Cave as well as the storage rooms of the Manfredonia, Foggia, and Taranto Museums.

Slowly, original team members were located (Linda Mount-Williams in Vista, California, and Dan Shimabuku in Manila), and new researchers were involved from Rome, Florence, Lecce, Genoa, Cambridge, Budapest, and elsewhere. Data were "excavated" from museum storerooms and displays or were recollected and studied, collated, analyzed, and eventually written up. Little by little—with lots of e-mails back and forth—I received chapters for editing, rewriting, checking, proofing, and organizing into an excavation report ready for peer review.

After locating and reassembling Scaloria's legacy data, we realized that this research exemplified a unique archaeological historiography, as it spanned three generations of Italian and American research. Furthermore, the application of today's methods of analysis enhanced information gained from the old data sets. Two examples, both using human skeletal parts: Particularly exciting for the study of diet and mobility were results from strontium, carbon, and nitrogen isotopic analysis; and researchers using taphonomy were able to evaluate the unique ritual of human burial as evident in the cave's Upper Chamber.

Nothing is as challenging and frustrating as working on an aging project, your own or another scholar's. The data is old; notebooks torn; tags hard or impossible to read; documentation scattered, incomplete, and often not in digital form; discs unreadable or requiring obsolete software; funding elusive; and the principal investigators no longer available. You may be in lockstep with tedium as you prepare, in good time, your own excavation for publication, but that proves a snap compared to someone else's aging data. Trust me: do not put off publication!

In the end, we excavated an excavation—all of us in room 401 (and by e-mail), including Abhishek Goël, Linda Vera, Stephanie Downey, Emmett Rosenbaum, Mariah Roessler, Diana Garcia, Caroline Arbuckle, Pat Oliansky, Terisa Green, Helen Wells, Helle Girey, Nancy Bernard, Tara Carter, Alice Hom, Carol Leyba, Živilė Gimbutas, and other colleagues in the United States and abroad. In the winter of 2016, I was joined by my coeditors and many authors in proudly delivering to the Cotsen Institute of Archaeology Press, for layout, design, and publication, the reviewed, revised, and accepted manuscript of enhanced legacy data: *The Archaeology of Grotta Scaloria: Ritual in Neolithic Southeast Italy*.

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# The Cotsen Laboratories



## South Asian Archaeology Laboratory

Monica L. Smith

The South Asian Archaeology Laboratory was established in 2002 and is the only lab on the West Coast devoted to the archaeology of the Indian subcontinent. Archaeological reference materials and study space are provided for research on the countries of South Asia, including India, Pakistan, Sri Lanka, Nepal, Bangladesh, and Afghanistan. The lab also houses a collection of Central Asian reference material, given the proximity and historic connections between this region and the Indian subcontinent as



The research collection in the lab highlights the diversity and range of scholarship on ancient South Asia.



Recent Cotsen Institute graduate Kanika Kalra organizes fieldwork photographs for her dissertation on medieval water management in India in the South Asian Archaeology Laboratory.

well as the growing interest of graduate students in this important research area.

India and its neighboring countries have extensive archaeological remains, starting with the oldest tool-using eras of the Paleolithic more than one million years ago. The subsequent human trajectory includes the beginnings of farming and the domestication of plants and animals, followed by the development of monumental architecture, multiple religious traditions, cities, and states. The subject of ancient urbanism is a particular focus in the lab, with research by lab members and their research partners in the ancient cities of Sisupalgarh (India) and Mahasthangarh (Bangladesh).

Because South Asian nations generally retain all the artifacts recovered from survey and excavation projects, the South Asian Lab is primarily devoted to building a collection of reading materials and providing study space for students in history, anthropology, and archaeology. Each year the lab participates in the Cotsen Institute Open House, with posters and displays on projects undertaken by graduate and undergraduate students. We look forward to more community and outreach events to highlight South Asian archaeology.





## Southeast Asian Archaeology Laboratory

Stephen Acabado

The Southeast Asian Archaeology Laboratory focuses on the archaeology of cultural contacts in the Philippines. In the last three years, work in the laboratory has helped argue for the late inception of the Ifugao rice terraces, a UNESCO World Heritage Site in the northern Philippines. Findings of the Ifugao Archaeological Project indicate that the rice terraces, once thought to be at least 2,000 years old, were constructed as economic and political responses to colonialism. Scholars have suggested that the Spanish conquest of the Magat River valley pushed the Ifugao to resettle in Philippine's Cordilleras between 1600 and 1700 for strategic reasons. Shortly after this, the Ifugao adopted wet rice agriculture and built extensive rice terraces in the Cordilleras. This agricultural movement established a ranked society that awarded political power to individuals skilled in mobilizing the community.

To support our contention that the shift to wet rice cultivation was the foundation of a successful resistance to colonialism, graduate student Queeny Lapeña is looking at the remains of ritually significant fauna in the archaeological record. She contends that domesticated animals, particularly pigs, are important in ritual feasting, politics, and social stratification. Queeny hypothesizes that the demand for domesticated pigs increased as the Ifugao prestige economy expanded



An ancient pig mandible recovered in the Ifugao region in the Cordilleras of the Philippines.

during the Spanish colonial period in the Philippines. She further argues that domesticated pigs were entangled in the maintenance of the ranked social order that emerged from resistance against Spanish colonialism. Although endemic wild pigs (*Sus philippensis*) live in the Cordilleras, contemporary Ifugao groups utilize only domesticated pigs for rituals. To investigate the emergence of this practice, we brought back samples of pig teeth for further analysis. Queeny is currently gathering morphometric data from pig dentition to identify wild versus domesticated pigs. This analysis will help uncover any temporal shifts in the distribution of these animals. We suspect that in the archaeological record, the frequency of domesticated pigs is higher in layers dated to the Spanish period.

Madeleine Yakal, another graduate student, is contributing to this research program by looking at beads recovered from infant burials in Old Kiyangan Village, Ifugao. She looks at the development of cultural complexity and elite formation through long-distance trade and interaction. She has observed that in Ifugao, local mortuary practices involve beads as burial goods. Her analysis shows that the majority of the beads from Old Kiyangan Village were imported, possibly brought by Chinese traders to the Philippines between 600 and 300 years ago. My own work, along with the investigations of Queeny and Madeleine, centers on the rethinking of dominant historical narratives in the Philippines, particularly the misconception that indigenous peoples were passive observers during the colonization process. We hope the research program will help rewrite history and that our work will promote heritage conservation.



Matt Peebles (Arizona State University), Katelyn Bishop, and Sarah Oas (Arizona State University) record ceramics in El Malpais National Conservation Area, New Mexico, in June 2016. (Photograph by Paul Reed, Archaeology Southwest)



## Southwestern Laboratory

*Gregson Schachner*

The archaeologists in the Southwestern Laboratory are engaged in diverse research projects examining many time periods and regions within the American Southwest. Collectively, our research shares an emphasis on simultaneously using multiple methodologies—geochemical, paleoethnobotanical, zooarchaeological, spatial, and quantitative—to explore long-term shifts in ritual, economy, subsistence, and ecology in the ancient Southwest. Our projects utilize a range of data that we collect through fieldwork in Arizona and New Mexico. They also leverage the extensive legacy of more than a century of high-quality fieldwork in Southwest archaeology through the use of museum collections across the United States. Another shared theme of work in our lab is collaboration with scholars at many institutions.

Greg Schachner is currently involved in two major field and museum projects. First, with National Science Foundation support and in collaboration with archaeologists from Arizona State University, Archaeology Southwest, Binghamton University, and the Bureau of Land Management, he is exploring how shifts in social identity and interaction were affected by demographic and ecological changes in west-central New Mexico from the Chaco era through the founding of the modern Pueblo villages in the region

(1000–1400 A.D.). Second, in partnership with scholars from the University of Redlands, James Madison University, and the Hopi tribe, he is part of a long-running effort to expand archaeological knowledge of the Hopi mesas of northeastern Arizona, one of the early and sustained heartlands of Pueblo settlement but among the least known archaeologically. This project melds traditional archaeological fieldwork with public education and tribal preservation efforts.

In addition to participating in these projects, anthropology graduate students Katelyn Bishop and Reuven Sinensky are pursuing independent dissertation projects. Katelyn's dissertation research examines Pueblo ritual and religion through an analysis of the use and significance of birds in ritual practice in Chaco Canyon during its tenure as the center of a regional social system (850–1150 A.D.). This year she will commence data collection and analysis for this research, using collections from four different museums across the country, recording material from a history of 120 years of excavation. Reuven's research examines the development, maintenance, and sustainability of land management strategies in portions of east-central Arizona that have long been considered marginal for agriculture yet exhibit continuous occupation by farmers from roughly 500 B.C. to 1475 A.D. He has spent portions of the last four summers analyzing ancient plant remains from Petrified Forest National Park and inventorying materials curated at the Museum of Northern Arizona that were excavated from the region in the 1970s but remain unanalyzed. These materials will be placed on loan to the Southwest Laboratory for final analysis. The strength of our laboratory derives from its diversity in interests and approaches, which together yield a richer view of the ancient Southwest.



# The Cotsen Laboratories



## Stone Age Laboratory

*Jim Sackett*

My specialty is the Old Stone Age (Paleolithic) of the Périgord region of southwestern France, whose extremely rich rockshelter sites—or “caves”—have made it a center for Stone Age research. In the late 1960s, my interest shifted from the shelters to the hitherto largely overlooked open-air sites in the region discovered by Jean Gausson, the last of the great amateur prehistorians in France. His generosity prompted the excavation of Solvieux, one of the largest Paleolithic open sites in Western Europe. The Solvieux project was designed as a joint UCLA–University of Bordeaux effort, which I directed in close collaboration with Gausson and the distinguished French prehistorian Professor François Bordes.

Several three-month field seasons, conducted with crews of about 20 students, removed 2,500 m<sup>3</sup> of deposits, resulting in 1 km of stratigraphic sections and nearly 2,000 m<sup>2</sup> of horizontally exposed archaeological deposits. These included 14 successive cultural levels, including one yielding an initial Upper Paleolithic industry never seen before, along with some 4,000 flint artifacts.

Analyzing the bulk of the Solvieux material took several years, resulting in several articles in French and English and culminating in a monograph published by the Cotsen Institute (*The Archaeology of Solvieux*, 1999). All the shaped, retouched stone tools were returned to France and are now housed in the Museum of Prehistory at Les Eyzies. Accompanying them are a few special items discovered at Solvieux, including two Magdalenian stone lamps, one of which equals the best ever found elsewhere in France, and



Jim Sackett hard at work in the Stone Age Laboratory.

a large stone block bearing traces of an engraving of deer and horse hooves in the same style as those painted on the walls of the famous Lascaux Cave.

The focus in the lab has since shifted from writing about what we succeeded to do at Solvieux to writing about where we failed. Archaeologists too often forget their responsibilities as scientists to explain their failures as well as their successes. Suffice it to say that this work involves the question of the structural validity of what we recognized as living floors and the maddening complexity of the deposits that contained them, which underwent major reworking during the 30,000 years of changing Ice Age climates to which they were subjected at Solvieux. In both cases, we can only hope to define the problems in empirically solid enough terms to help guide more enlightened open-air researchers to come.

Despite its name, the Stone Age Laboratory has over the years produced a substantial number of publications on less arcane, mind-wearying topics than the Paleolithic as it presents itself in the ground. These mostly concern the history and theory of archaeology, such as comparisons of French and American approaches to prehistoric research, biographical sketches of distinguished archaeologists, and the tangled historical question of how human antiquity came to be established in the nineteenth century. Now I am returning to the controversial issue of style in archaeology, a hare that I have been chasing on and off for 40 years.

# The Cotsen Laboratories

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## Zooarchaeology Laboratory Happenings

Thomas A. Wake

Over the last year or so, activity in the Zooarchaeology Laboratory (Bone Laboratory) has focused on the identification and analysis of vertebrate faunal remains from islands across the Pacific, including Rapa Nui (Easter Island); Isla Pedro Gonzalez in Panama's Pearl Islands (Cooke et al. 2016); Tiga (Tokanod) in the Loyalty Islands off New Caledonia (Daza et al. 2015); and Anacapa, Santa Cruz, and San Miguel in California's Channel Islands.

In September 2015, lab director Tom Wake traveled to Rapa Nui to identify and analyze vertebrate faunal remains recovered from the excavation of two Moai in Rano Raraku Crater conducted by the Easter Island Statue Project, run by Rock Art Archive director Jo Anne Van Tilburg. While on the island, Wake added 33 fish skeletons to the island's comparative osteological collection (now totaling 62 fish skeletons representing 42 genera and 43 species) and identified 25 genera and 17 species of fish, as well as chicken and Polynesian rat bones.

Wake's analysis of marine mammal remains from Isla Pedro Gonzalez is included in Cooke et al. 2016. The Playa Don Bernardo site represents a 6,000-year-old preceramic agricultural occupation of the Pearl Island archipelago. The site's inhabitants harvested various marine resources (shellfish, fish, sea turtles, and dolphins); terrestrial vertebrates (opossums, Central American agoutis, pacas, spiny rats, capuchin monkeys, brocket deer, mud turtles, iguanas, and

boas); and birds (cormorants, yellow-crowned night herons, sooty shearwaters, great egrets, and doves). Several of the identified terrestrial mammals—opossums (*Didelphis marsupialis*), spiny rats (*Proechimys semispinosus*), furred spiny rats (*Diplomys labialis*), and brocket deer (*Mazama* sp.)—no longer occur on Pedro Gonzalez. Three species—mud turtles (*Kinosternon* sp.), pacas (*Cuniculus paca*), and capuchin monkeys (*Cebus* sp.)—are gone from the entire Pearl Island archipelago, probably driven to extinction by human overexploitation.

Over the past few years, the Bone Lab has examined terrestrial faunal specimens recovered from a variety of sites on the island of Tiga (Tokanod) by Ian Lilley (University of Queensland) and Christophe Sand (Institut d'archéologie de la Nouvelle Calédonie et du Pacifique). The most common terrestrial vertebrates are mammals, primarily Polynesian rats and a few fruit bat specimens. The most diverse terrestrial vertebrates are reptiles. Wake sorted out the reptile specimens and sent them to Aaron Bauer's lab at Villanova University, where Juan Daza and Bauer identified two skinks (*Emoia loyaltiensis*, *Lioscincus nigrofasciolatus*), four geckoes (*Bavayia crassicollis*, *Bavayia* sp., *Gehyra georgpottasti*, *Nactus pelagicus*), and a boid snake (*Candoia bibroni*). Burned *Candoia* vertebrae suggest human consumption of these boas (Daza et al. 2015).

Channel Islands field projects have provided several vertebrate archaeofaunas to the Bone Lab for analysis. Todd Braje (San Diego State University) provided the mammal, bird, and herp remains from a recently excavated site on San Miguel Island (CA-SMI-481). Lynne Gamble (University of California Santa Barbara) provided fish, herp, bird, and mammal remains from the El Rincon site (CA-SCRI-333) on Santa Cruz Island. Torrey Rick (Smithsonian Institution) provided herp, bird, and mammal remains from two Anacapa Island sites (CA-ANI-2 and CA-ANI-4).





Left to right: William S. Ayres, Thomas A. Wake, José Miguel Ramírez, Cristian Arévalo Pakarati, and Patricio Madariaga Paoa near La Pérouse Bay, Rapa Nui.

While identification of the specimens is complete, analysis of the results for all these collections continues. Marine mammal remains, especially California sea lion and Guadalupe fur seal, dominate the San Miguel Island site. The El Rincon site includes a considerable number of dolphin bones. Both El Rincon and ANI-2 include black-tailed deer cannon bones (metapodials). Deer are not native to the Channel Islands, so any deer bone must have been imported from the mainland. The manufacture of thin, bi-pointed fish gorges using imported deer metapodials as raw material is evident at both sites. Finally, the northern Channel Island sites mentioned above all produced at least a few short-tailed (*Phoebastria albatrus*) and black-footed (*P. nigripes*) albatross bones. Both albatross species are currently threatened with extinction due to habitat loss and consumption of plastic trash at sea.

The Bone Lab's staff, Mercedes Duque, Kay Hullett, and Judy Porcasi; UCLA undergraduates Jessica Lopez and Ayla Olsen; and several other student volunteers identified bone specimens, entered data, and curated the archaeological collection and the lab's comparative osteological collection.

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# Selected Classes

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In addition to laboratory analysis, an important aspect of academic archaeology is preparing the next generation. This work entails not only training in the field but also instruction in the classroom and the laboratory. Below are descriptions of a selection of noteworthy and exciting classes offered by affiliates of the Cotsen Institute.

## Quantitative Methods in Archaeology Using R

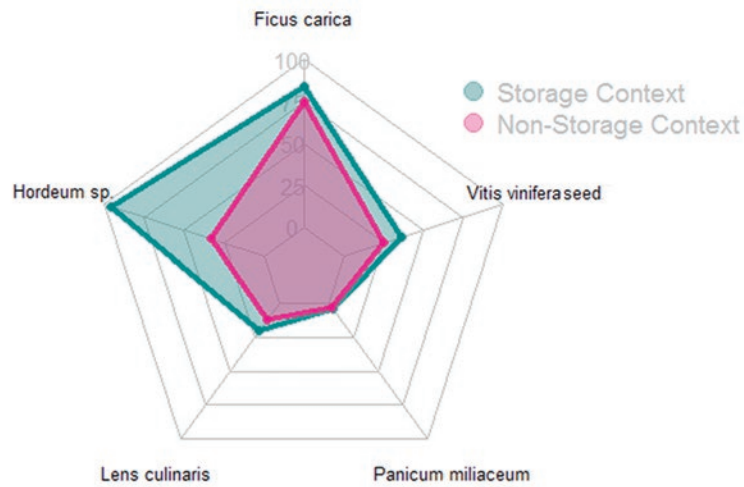
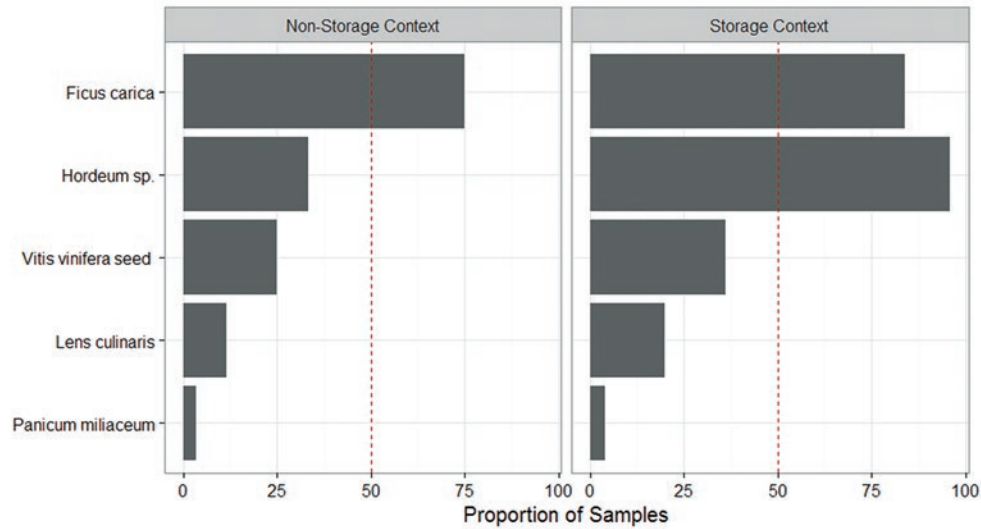
*Alan Farahani*

In the winter quarter of 2016 the Cotsen Institute offered a new course titled Analysis and Visualization of Quantitative Archaeological Data in R (Archaeology M205B). R is a free, open-source programming environment tailored for statistical analysis and data visualization. There was a time when most analytical methods were restricted to powerful computers and arcane interfaces, but they are now available to anyone with a computer and an Internet connection. Nevertheless, mastery of R entails learning to write code, as the program uses a command-line interface to execute instructions. One advantage of R is that researchers can design analyses specifically for their data rather than trying to force data through applications that may not be ideal or appropriate for their goals. One disadvantage, however, is that without a click-through windowed interface, there is a steep learning curve.

The objective of the course was to introduce graduate students to basic statistical and data-analytic methods in archaeology, some philosophy of science directly related to these concepts, and implementation of these analyses using R. Much of the course revolved around issues specific to archaeological data in all their varied forms, collection methods, limitations, and potentials. One reason for emphasizing a statistical programming platform such as R (or Python) is that such programs have increasingly become essential tools for data visualization and analysis across many disciplines, allowing for greater inter-disciplinary communication and use of analytic methods. R enables users to reproduce without great difficulty the analyses and visualizations of other researchers by simply rerunning their command-line “recipes.” The ability to reproduce the analyses of other researchers has become a major responsibility in contemporary scientific practice.

Participants in the class were introduced to some best practices of data reproducibility—for instance, by using R Markdown, a framework specifically designed for this task. Although there were occasional cries of distress and mumblings of rebellion, particularly when students faced the demands of console-based programming, each final project indicated a high degree of absorption of the material, and each was impressive in its own right. Projects included using chemical elements to find geographic associations between lithic tools in Neolithic Armenia; investigations of changes





Two visualizations of the same data set showing proportional abundance across samples of different kinds of economically valuable crops from the Iron Age (circa 1000 B.C.E.) archaeological site of Khirbet al-Mudayna al-Aliya in central Jordan. The visualization at the top is a bar chart; the red dashed line shows the 50 percent threshold (meaning that half of the analyzed samples have the seeds of that economic crop). The bottom image is a polar plot, or spider chart, illustrating the same data. The data are divided between storage and nonstorage contexts, as interpreted by the excavators of the material.

in abalone sizes in the Mid-Holocene Channel Islands to detect climate change and indigenous resource use; an analysis of textile size measurements and attributes from a late prehistoric mass grave from central Peru to identify potential social groups; and an analysis of more than 1,000 pottery vessels from early Bronze Age northwestern China to identify techniques of standardization in ceramic manufacturing. Indeed, the course was as much a learning experience for the instructor as it was for the participants, and the

feedback of the latter will be incorporated profitably into future iterations of this course. Overall, it is hoped that students' newly acquired skills provide the foundation for continued learning and that they will improve upon and shape archaeological data analysis and visualization throughout their careers.

## Experimental Archaeology at UCLA

Thomas A. Wake

For the past few years I have taught a course entitled Experimental Archaeology. A laboratory class (Anthropology 117P/Archaeology M205S), the course focuses primarily on craft production through replication of a wide variety of artifact classes represented in the archaeological record. Ten four-hour meetings provide the time for discussion, demonstrations, and student projects. The first half of the course involves demonstrations of various craft production techniques using different classes of raw material—stone and organics such as bone, shell, wood, and fiber. The second half of the class is devoted to student projects. Each student is required to produce a finished artifact using preindustrial techniques without the use of metal tools.

Readings covering the organization of craft production, the role of craft specialists in past societies, and *chaîne opératoire* studies provide a theoretical framework for the interpretation of material cultural remains related to the production of various artifact classes in archaeological contexts. I emphasize that archaeologists find various finished examples of refined, skilled, and generalized craft production in domestic, ritual, and burial contexts but rarely in production contexts. Finished artifacts produced by craft specialists are distributed to the broader community. Evidence of their production—the mess left behind—remains associated with workshops and their trash deposits. The production waste tells stories of manufacture, including production techniques, stages of production, supply of raw materials, social organization, and even the social status of the persons responsible.



Selected demonstration examples and final student projects produced during the Experimental Archaeology class.

The actual production of material culture can be quite messy, producing a variety of waste. One of the primary goals of this class is to produce a glorious mess. Five weekly demonstrations of cordage production; chipped and ground stone artifact production; and wood, bone, and shell working all result in a few finished artifacts, preforms, and piles of waste. During these demonstrations, the class observes and discusses the various stages of production necessary to make the intended outcomes and the types of waste produced at each stage. Students learn quickly that the waste they produce tells the story of their finished examples.

The last five weeks of the class are devoted to student projects, with guidance from the instructor. Much of the raw material for stone, bone, and shell working is provided, but students are encouraged to pursue specific interests or raw materials as they desire. More often than not, students discover that they need to produce a specific suite of tools and learn certain skills to complete their projects. How exactly does one put a hole in a hard material such as stone, bone, or shell? Individual projects have included the production of polished basalt adzes, marble mace heads, *molcajetes* (Mesoamerican mortars and pestles), chipped stone drills, shell fishhooks and beads, bone rings, projectile points, hairpins, musical instruments, and yucca fiber shoes and netting. Many students have asked about producing ceramics and investigating metallurgy. These future avenues of experimentation depend on developing facilities equipped with the high temperatures necessary to fire ceramics, smelt ore, and cast metal. The students' final projects serve to cement an appreciation of how difficult the production of a single museum piece can be and the amount of effort it takes to create such an object.



# Selected Classes

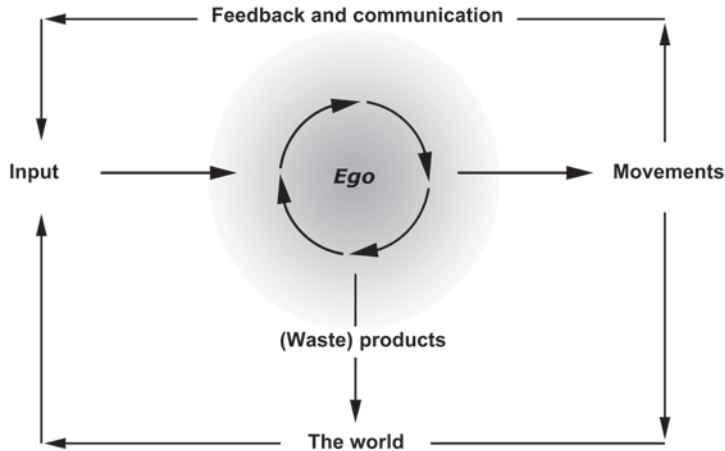


Figure 1. Schematic representation of our being in the world. Movement constitutes the relevant output of our intricately integrated body and mind (ego), which is separated from the surrounding world (the *Umwelt*, or weather world) with diffuse borders.

## Movement in Art, Philosophy, and Daily Life

*Hans Barnard*

The class Movement in Art, Philosophy, and Daily Life (COMLIT 180SL) explores the relationship between humans and the world around them, a subject central in anthropological archaeology and philosophical anthropology. This issue is often approached as an exclusive function of our brain—a problematic hypothesis, as a brain is as ineffective without a body and its senses as a body is without a brain. The relevant output of the brain, irrespective of what may or may not go on inside it, is control over our movements. In living animals, a central facility, identified as sentience or consciousness, exists to integrate the often complex input and to decide on a course of action (Figure 1). Intricately connected with the ability to move in a controlled fashion, this facility creates a sense of unity and continuity, both in time and space, as well as a sense of urgency to keep the individual functional, whole, and safe. Our experience of ownership and agency is also inseparably associated with the biological systems that control our movements. I am able to initiate, monitor, and control my movements, and it is I who moves. Our movements thus play a vital part in constructing the environment that

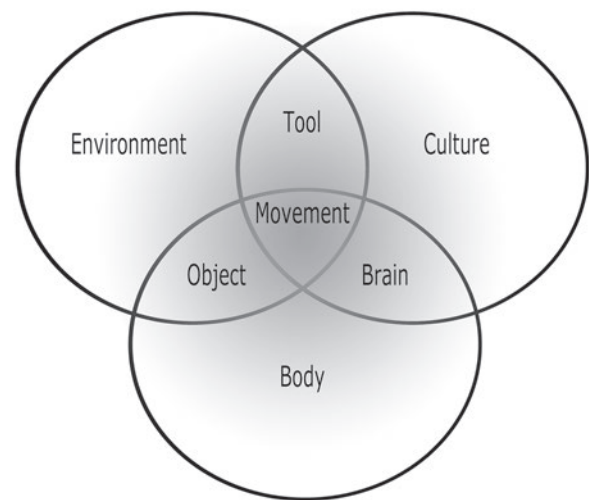


Figure 2. Schematic representation of spheres of interaction between the body and its natural and social environment. Movement takes a central place; the gray background symbolizes our sentience or consciousness, which is the platform on which all elements come together.

surrounds and permeates us (Figure 2). It is thus not so much “I think, therefore I am” but rather “I move, therefore I am.”

This rephrasing of the classic Cartesian concept, and how movement as well as limitations of mobility relate to personal and community identity, is explored in this service-learning class. Service learning integrates instruction with community service to enrich the learning experience, encourage civic responsibility, and strengthen the local community. Students taking this class are required to devote at least 20 hours to

# Selected Classes

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## Archaeology and Metadata

Rachel Moy

### Movement in Art, Philosophy, and Daily Life *(continued)*

the off-campus service-learning component, working with an organization that engages humans in activities to stimulate thought and to promote well-being. In 2016 the class community partners were the Kindred Spirits Care Farm in Reseda and WISE & Healthy Aging in Santa Monica. To facilitate and follow the discussions in class, students have to study one selected scientific article each week and watch one of the following movies: *Freaks* (Ted Browning, 1932), *Civilisation*, episode 12 (Kenneth Clark, 1969), *Grass: A Nation's Battle for Life* (Merian Cooper and Ernest Schoedsack, 1925), *Hawking* (Stephen Finnigan, 2013), *Game Over: Kasparov and the Machine* (Vikram Jayanti, 2003), *Koyaanisqatsi* (Godfrey Reggio, Philip Glass, and Ron Fricke, 1982), *Being in the World* (Tao Ruspoli, 2010), and *Pina* (Wim Wenders, 2011). They furthermore need to read at least three of the following seven novels: *Lucky Jim* (Kingsley Amis, 1954), *The Mayor of Casterbridge* (Thomas Hardy, 1886), *A Single Man* (Christopher Isherwood, 1964), *On the Road* (Jack Kerouac, 1955), *The Defense* (Vladimir Nabokov, 1930), *Cat's Cradle* (Kurt Vonnegut, 1963), and *The Picture of Dorian Gray* (Oscar Wilde, 1891). Students conclude the class with an individual research project, which is presented during the last session (this year unfortunately interrupted by the campus-wide lockdown of June 1).

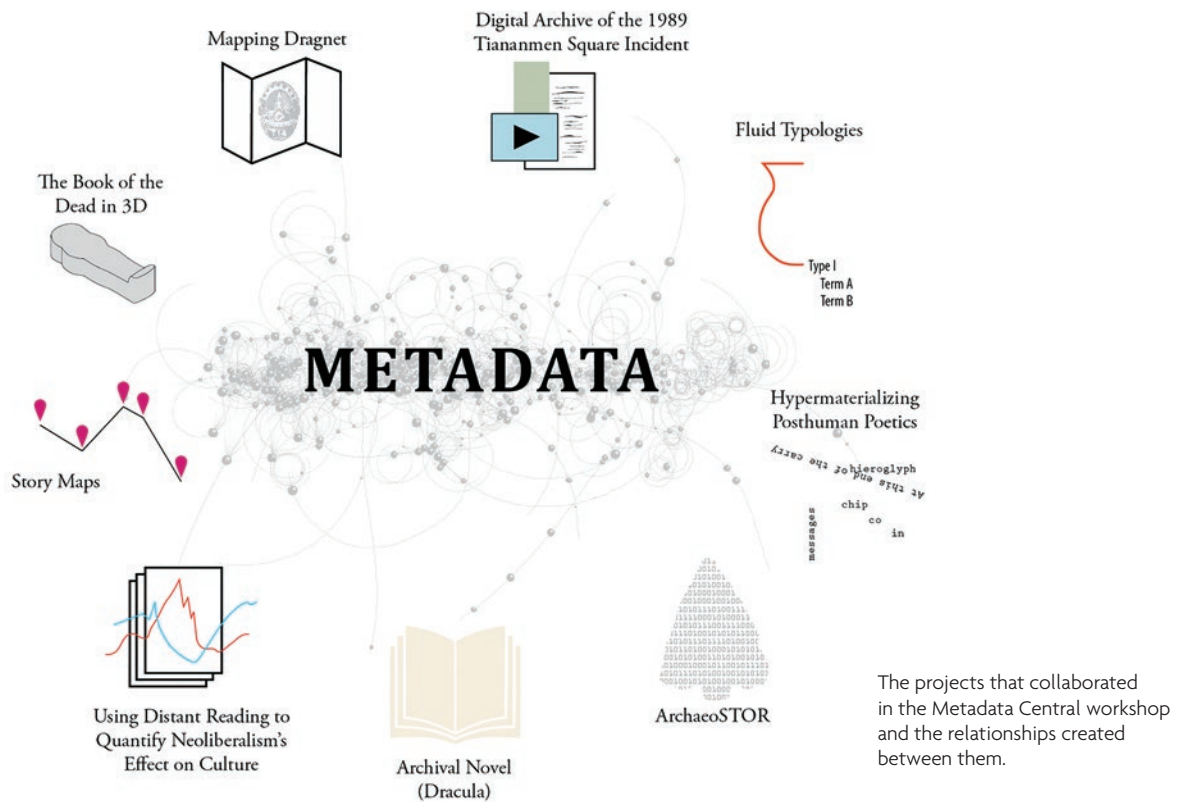
From February through June 2016, I participated in the Metadata Central workshop hosted by the UCLA Center for Digital Humanities. The purpose of this workshop was to train graduate students from different University of California campuses to work effectively with metadata specific to their individual projects. Metadata (information that describes data) and its maintenance are essential for research and for sharing work with other scholars and the general public. Sharing and collaboration were emphasized in many aspects of the meeting, which was attended by a group of students from different campuses and disciplines.

At the first meeting in February, faculty, librarians, and staff introduced key concepts and issues related to metadata. Following this, they presented a number of completed or ongoing projects in which metadata and its management were essential. The topics of these talks ranged from Egyptian archaeology to Scandinavian literature. Finally, each student participant introduced a research project that had metadata as a key component. The students continued to work on these projects until June. To facilitate collaboration, workshop coordinator Deidre Whitmore—now Digital Archaeology Laboratory and data publication manager at the Cotsen Institute—set up an online hub where we could discuss projects and share resources, and also for weekly video meetings. Each week a different student discussed the progress of his or her project and received feedback from the other participants. Experts such as Andy Rutkowski, a UCLA librarian familiar with ESRI Story Maps software, occasionally joined us to address particular questions or issues. In this way, participants were kept on track and encouraged by their peers.

In June, we met in person in the Scholarly Innovation Lab at the Young Research Library at UCLA to share the results of four months of work and to discuss the future of our respective projects. Throughout the process, the feedback shared by students, faculty, librarians, and staff was transformative, certainly in my case. Because our external exposure is often restricted by our disciplines and campuses, we gained insights that we would not have received otherwise.

Alanna Bartolini (UC Santa Barbara) is building a database and digital edition of Bram Stoker's *Dracula*





as a model for extracting metadata from epistolary novels. The database will lead to easier queries that can bring up and answer a range of interesting questions. Racquel Gonzales (UC Irvine) intends to map actual historic demographics and crime statistics against those from the 1950s television series *Dragnet*. She hopes to learn about interactions and differences between media portrayal, public interpretation, and reality in Los Angeles. Kea Johnston (UC Berkeley) is designing a platform to relate texts on Egyptian artifacts and their content with three-dimensional models. With the completion of this project, users will be able to search for metadata on both ancient texts and objects. Edward Lanfranco (UC Merced) is creating an open-access, bilingual archive of documents from the Tiananmen Square demonstrations. Edward has his own collection of flyers and propaganda from 1989 but hopes to add content from other archives. Sarah Lozier (UC Riverside) hopes to build a database to better interact with and visualize Posthuman Poetics, a group of poems that can be read in different orders and interpreted in many ways. Craig Smitheram (UC San Diego) is working on an already-functioning database system that he hopes to connect with the UC San Diego Library Research Data Curation program to preserve archaeological data in the long term. Keith Spencer (UC Santa Cruz) plans to use text-mining software to identify defining words or phrases in neoliberal novels. He is currently considering expanding his methods to include sentiment-analysis algorithms. Katharine Trostel (UC Cruz) will explore how spaces

are portrayed, used, and changed in Marjorie Agosin's poems and prose. She is using Story Maps software to examine place and movement by integrating digital mapping with material from Agosin's *Cartographies*.

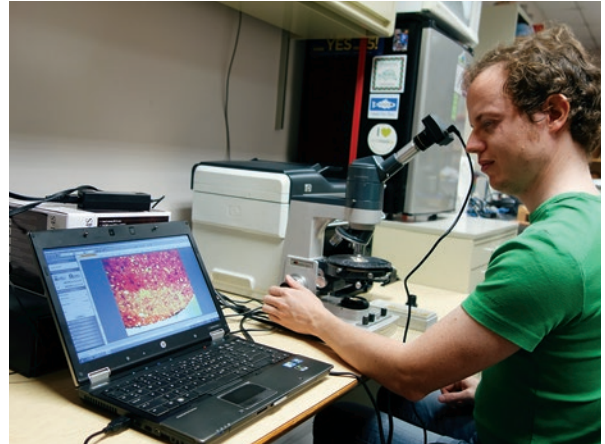
The variety of our projects and backgrounds was the strength of this workshop. Viewpoints resulting from very different experiences led to innovation in individual projects. I came into the workshop with a rather abstract idea: to create a digital space where the small group of ceramic specialists working in Ethiopia could discuss terminology (and hopefully agree on standard definitions), share their data, and create flexible types and typologies that could be easily changed as needed and discussed among peers. I entitled my project Fluid Typologies: Analysis of Archaeological Ceramics from Mai Adrasha. At the first meeting, the other participants gave me a lot of feedback. I began to plan what steps to take and learned what was feasible and what was not. I discovered that Deidre was working on a website that needed similar functionality for Dig Data, the new Linked Open Data system of the Cotsen Institute of Archaeology Press. We joined forces to work on my website idea. We have been making headway since, and our website will be ready to go live in January 2017.

Additional information on the workshop can be found at <http://www.cdh.ucla.edu/metadata-central/>, <http://www.arcgis.com/apps/MapJournal/index.html?appid=eef83fa346ea459facacf7ee2a37ff50>, and: <http://www.cdh.ucla.edu/news-events/metadata-and-ancient-ceramics/>.

### Report from the Chair of the Archaeology Interdepartmental Degree Program

*John K. Papadopoulos*

THE ARCHAEOLOGY Interdepartmental Degree Program continues to thrive. This September we welcome five new graduate students, including two international students. Anjum Malik hails from Islamabad, Pakistan. A graduate of Cornell University, where she majored in archaeology and anthropology, Anjum comes to UCLA to focus on South Asia and to study with Monica Smith. The other international student, Amr Shahat, was born and raised in Egypt. Inspired by the monuments of his homeland, Amr, a graduate of Helwan University in Cairo, won a scholarship to attend the University of Memphis, where he completed an MA in Egyptology. Amr will study with Willeke Wendrich. Another entering Egyptologist,



Graduate student Richard Ehrich examines microscopic slides of Neolithic pottery from central China.

Robyn Price, received a BA from Lycoming College, an MA in linguistic anthropology from the University of Virginia, and an MA in Egyptian art and archaeology from the University of Memphis. Robyn, who grew up in Virginia, will begin her studies at UCLA under the guidance of Kara Cooney and Willeke Wendrich. Kirie Stromberg grew up in the Midwest. In addition to studying English language and literature at Yale University, Kirie began her studies of Chinese at Yale, and it was this that inspired her to pursue her interests in Chinese culture; she completed an MPhil in Chinese Studies at the University of Cambridge. She enters our program to study with Lothar von Falkenhausen and Li Min. Another student, Danielle Kalani Heinz, is the recipient of the UCLA Dean's Prize. A recent graduate of the University of California–Berkeley, where she focused on human biology, ancient Near Eastern archaeology, and comparative studies of sexuality, Danielle—a native Hawaiian who grew up on the mainland—was drawn to Pacific archaeology by her desire to experience and help preserve Hawaiian culture. Danielle enters the program to study Pacific archaeology with Stephen Acabado. Please join me in welcoming our diverse and talented incoming class.





Anke Hein excavating in southwestern China.

## Student and Faculty Achievements

*John K. Papadopoulos*

EVERY YEAR WE CELEBRATE the combined achievements of our students and faculty, and this year has been an especially successful one. It is fitting that I begin with student achievements, since 2016 finds many of our students on the brink of their doctoral degrees and new careers.

### GRADUATE STUDENT ACHIEVEMENTS

I begin not with our most recent PhDs but with those who finished in the past three years, relating their subsequent achievements. One measure of the success of any graduate program is the placement and profes-

sional accomplishments of its graduates. Last year we were happy to announce that our first graduate student from Albania, Esmeralda Agolli (PhD 2014), had secured a tenure-track teaching position in the new Department of Archaeology and Cultural Heritage at the University of Tirana. This year we are pleased to announce that she has been awarded tenure and will guide and mentor the next generation of Albanian prehistorians in the years to come. Another of our graduates, Anke Hein (PhD 2013), in January 2016 began her duties as associate professor in Chinese archaeology in the School of Archaeology at the University of Oxford, where she is a fellow of Saint Hugh's College. Yet another of our recent graduates, Bethany Simpson (PhD 2014), has been appointed as a postdoctoral fellow at the Getty Villa (Fall 2016) in connection with

## REPORTS FROM THE CHAIRS

### Student and Faculty Achievements

*(continued)*

its current research theme, “The Classical World in Context: Egypt.” She will work on a contextual study of domestic paintings in Roman Egypt.

The past academic year brings a bumper crop of newly minted Cotsen Institute of Archaeology PhDs. Chelsey Fleming completed her dissertation, entitled “Seeing Icons: Greek Sculpture from Sanctuary to Gallery,” under the supervision of Sarah Morris. Three other students—Christine Johnston (also supervised by Morris), Kanika Kalra (supervised by Monica Smith), and Karl LaFavre (supervised by Chip Stanish)—filed their dissertations in the course of the summer of 2016. Christine’s dissertation is titled “Networks, Intermediaries, and Empire: Ceramic Exchange Systems in the Late Bronze Age Mediterranean.” Kanika’s is entitled “Water Management and Settlement Patterns in South India from circa the Eleventh to the Sixteenth Centuries A.D.” Karl’s is on “Macro-Scale Political History of the Lake Titicaca Region, Peru and Bolivia: A Synthesis and Analysis of Archaeological Settlement Patterns.” The program is particularly grateful to David Boochever for generously funding a portion of Kanika’s fieldwork in India. It is worth adding that Christine has been appointed a visiting instructor in the Department of History at Western Washington University (Bellingham) for the 2016–2017 academic year. Two other students, Evan Carlson and Hannah Lau (both supervised by Elizabeth Carter), are poised to submit their dissertations in the coming months. Evan’s is entitled “Inscribing the Landscape: City and State Building in Late Bronze Age Greater Mesopotamia,” and Hannah’s is entitled “Mobility, Cooperation, and Emergent Political Complexity in the Late Neolithic Near East.” Lana Martin, who recently completed her PhD in anthropology, has been closely connected to the Cotsen Institute throughout her graduate career. Lana’s dissertation is an analysis of the faunal and floral remains at Sitio

Drago, Panama. It is entitled “Forests, Gardens, and Fisheries in an Ancient Chiefdom: Paleoethnobotany and Zooarchaeology at Sitio Drago, a Late Ceramic Period Village in Bocas de Toro, Panama.”

Several of our PhD students were successful in winning yearlong fellowships to conduct their dissertation research. Brandon Braun (supervised by John Papadopoulos) won the Philip Lockhart Fellowship at the American School of Classical Studies at Athens for 2016–2017; Brandon will spend the coming year in residence in Greece to begin research on his thesis about ancient Greek victory monuments. Adam DiBattista (also supervised by Papadopoulos) secured a UCLA Graduate Research Mentorship. Shi Tao (supervised by Lothar von Falkenhausen) won a Chiang Ching-kuo Fellowship for 2016–2017. Two of our students won UCLA Dissertation Year Fellowships, which will allow them to complete their dissertations. They are Ellen Hsieh (supervised by von Falkenhausen and Li Min) and Trevor van Damme (supervised by Sarah Morris and John Papadopoulos), who was an associate member and an Ione Shear Mylonas Fellow at the American School of Classical Studies at Athens in 2015–2016. Several students won smaller grants for their research. They include Karime Castillo, who was awarded a UCLA Latin American Institute Summer Research Grant as well as a UCLA Center for Mexican Studies Together We Can Award and a SEP Complementary Fellowship (from the Secretaría de Educación Pública de Mexico). Jacob Damm won both a Roter/Bluma Appel Research Travel Grant and an Egypt Exploration Organization of Southern California Scholarship. Ellen Hsieh was awarded a Hiroshi Wagatsuma Graduate Fellowship (from the UCLA Asia Institute) and a Harry and Yvonne Lenart Graduate Travel Fellowship in 2015, as well as a 2016 Everett Helm Visiting Fellowship at the Lilly Library, Indiana University–Bloomington. Georgi Kyorlenski won an Early Modern Summer Research Mentorship, and Anna Bishop won a Foreign Language and Area Studies (FLAS) Grant to learn Yucatan Mayan. In addition, Karime Castillo, Alison Crandall, and Vera Rondano all received UCLA Summer Graduate Research Mentorships. We wish them all success in their research.



Kristine Martirosyan-Olshansky and two Armenian colleagues (Pavel Avetisyan and Varduhy Melikyan, both of the Institute of Archaeology and Ethnography in Armenia) were awarded an Armenian National Science Foundation (ANSEF) Grant for research at the Middle Bronze to Early Iron Age necropolis of Karashamb (Armenia). The ANSEF Grant is a prestigious and competitive one, much like a National Science Foundation Grant in the United States; each year, only one is given for archaeological research. Kristine will use the funding to analyze the lithic assemblage and to build a comprehensive database for the site.

The following students all advanced to candidacy in the course of the 2015–2016 academic year: Caroline Arbuckle (studying with Kara Cooney and Willeke Wendrich), Brandon Braun (with John Papadopoulos), Jacob Damm (with Aaron Burke), MaryAnn Kontonicholas (with Papadopoulos), Georgi Kyorlenski (with Stella Nair), and Deborah Sneed (with Sarah Morris and John Papadopoulos). The following students successfully completed their MA degrees: Anna Bishop (studying with Richard Lesure), Karime Castillo (with Lesure and Ioanna Kakoulli), and Adam DiBattista (with Papadopoulos).

Several of our students authored or coauthored papers that were published in 2015–2016 or are currently in press. They include the following (in alphabetical order):

- Barnard, H., W. Z. Wendrich, B. T. Nigra, B. L. Simpson, and R. T. J. Cappers. 2015. The Fourth-Century A.D. Expansion of the Graeco-Roman Settlement of Karanis (Kom Aushim) in the Northern Fayum. *Journal of Egyptian Archaeology* 101:51–67.
- Elezi, G. Forthcoming. By the Rivers They Settled: Settlement Patterns and the Neolithic Landscape of Albania. Proceedings of the Humboldt Conference: Northern Greece and Southeastern Europe during the Neolithic Period, Thessaloniki, June 26–29, 2014.
- Hsieh, E. In press. The Power of the Images in the Boxer Codex and Cultural Convergence in Early Spanish Manila. In *Historical Archaeology of the Early Modern Colonialism in Asia Pacific*, vol. 2, edited by Maria Cruz-Berrocal and Chenghwa Tsang. Gainesville: University Press of Florida.

- Johnston, C. 2016. Diamonds in the Dust: The Underlying Pedagogical Value of Old Material Collections. *Near Eastern Archaeology* 79 (June):2.
- D. Urem-Kotsou, A. Dimoula, G. Elezi, T. Papadkou, A. Papaioannou, N. Saridaki, I. Siamidou, T. Silva, E. Tzemopoulou, and K. Kotsakis. Forthcoming. Patterns in Contemporaneous Ceramic Traditions: Interregional Relations between Thessaly and Macedonia during the Early and Middle Neolithic. Proceedings of the conference Communities Landscapes, and Interaction in Neolithic Greece, Rethimno, May 29–30, 2015.

#### FACULTY ACHIEVEMENTS

Two core faculty members of the Cotsen Institute received endowed chairs. Richard Lesure (Anthropology) was named the inaugural Marilyn Beaudry-Corbett Chair in Mesoamerican Archaeology, and Monica Smith (Anthropology) was awarded the Navin and Pratima Doshi Chair in Indian Studies.

Lothar von Falkenhausen (Art History) was recently elected to the American Philosophical Society, and John Papadopoulos (Classics) was elected a fellow of the Society of Antiquaries in London. The new director of the Cotsen Institute, Willeke Wendrich (Near Eastern Languages and Cultures), was awarded the UCLA Faculty/Staff Partnership Award, and Cotsen affiliate Sharon Gerstel (Art History) won the prestigious Runciman Book Prize for her 2015 volume *Rural Lives and Landscapes in Late Byzantium*, published by Cambridge University Press. And last but not far from least, Stella Nair (Art History) received a double-header, winning both a Guggenheim Fellowship and a Rome Prize for her research on Peru and its connections with Rome and the Old World.

### Incoming Graduate Students

John K. Papadopoulos

#### DANIELLE KALANI HEINZ

is a recent graduate from the University of California–Berkeley, where she focused on integrative biology and enrolled in an interdisciplinary program involving comparative studies of sexuality. During her undergraduate career, she focused on human biology, ancient Near Eastern archaeology, queer theory, and theology, also enrolling in classes at the nearby Graduate Theological Union.

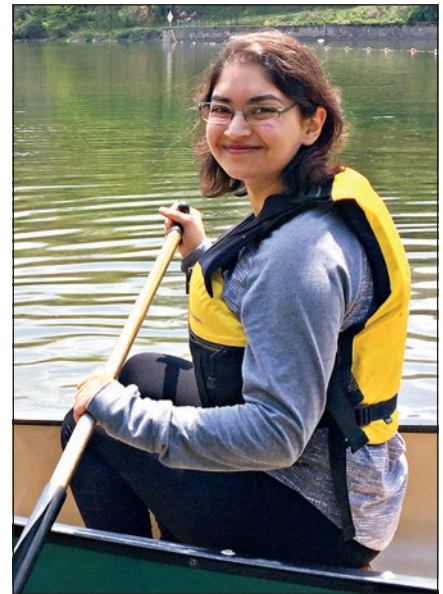
Her self-designed interdisciplinary program was inspired by her passion to combat queerphobia in Christianity and her drive to highlight how studying Christianity in tandem with sexuality can lead to new theoretical insights. Results of her studies include “Biblically BDSM: Exploring a Genderqueer Trinity and Its Implications for Modern Churches,” which she presented at the 2015 Annual Conference of the Society for the Scientific Study of Sexuality, and her senior thesis, “Built on Sand: The Historical Roots of Modern Queerphobia within Christianity.”

She was drawn to Pacific archaeology later in her academic career by her *aloha ‘āina*, a desire to help preserve Hawaiian culture, and by the opportunity to experience Hawaiian culture in a way that had not been afforded to her as a native Hawaiian growing up on the mainland. The summer before her senior year, she had the opportunity to excavate in her second home, Maui, under the guidance



of Berkeley Pacific archaeology PhD student Kirsten Vacca, and she was awarded a Hibben Fellowship to study Hawaiian archaeology at the University of New Mexico with Michael Graves. In New Mexico she compiled research on gender and status in North Kohala, Hawaii, a report presented at the 2015 Society for Hawaiian Archaeology Conference.

She spent the remainder of her senior year running back and forth between classes, the Phoebe A. Hearst Museum of Anthropology, the Oceanic Archaeology Laboratory, and the University of California Museum of Paleontology in hopes of pinpointing her field of study and expanding her knowledge of Hawaiian archaeology. As a Pacific archaeologist, she hopes to learn Hawaiian, help decolonize Pacific Island history, better understand how gender—including third genders—shaped religion and society in the Pacific, help preserve Pacific Islander traditions, and explore how queer, postcolonial, and indigenous theory can shape archaeological research. She plans to work extensively with the Hawaiian community to develop research questions significant to Hawaiians and to help prevent further Westernization and disrespect of Hawaiian history and *‘āina*.



#### ANJUM MALIK

was born and raised in Islamabad, Pakistan. In 2016 she received her BA from Cornell University, where she majored in both archaeology and anthropology, with a minor in German studies. Anjum explored multiple avenues of archaeology during her time at Cornell. She supplemented her courses with a semester abroad at University College London, a two-week Greek mythology summer course in Athens, and a six-week excavation in Naples, Italy. She worked as a photographer and digital editor for Cornell’s Cuneiform Tablet Laboratory for two years and served as president and vice president of the Undergraduate Anthropology Club at Cornell.

In 2015 Anjum designed and conducted a summer research project in New York and Washington, D.C., that investigated perceptions of heritage iconoclasm. She focused on how geographical and sociocultural proximity to iconoclastic incidents can cause synchronic depictions of heritage destruction events and lead to historically decontextualized opinions. This research project became the basis of Anjum’s senior honors thesis, which earned her magna cum laude honors.

She also participated in a research seminar on watermark identification in Rembrandt’s etchings. In this project, she helped develop a decision tree classifying model for watermarks, contributed to an interactive website that allows users to identify particular watermarks, and cocurated a Rembrandt watermarks research exhibit at the Cornell Johnson Museum.

Anjum intends to pursue South Asian



archaeology at UCLA and is passionate about issues of cultural exchange and connectivity, ethnic diversity, public archaeology, and heritage. Her goal is to be part of the revival of archaeology in Pakistan and to combine her fieldwork and research with public archaeology. She hopes to establish collaborations with museums, local communities, and cottage industries to stimulate long-term archaeological interest, participation, and promotion at a grassroots level.



**ROBYN PRICE**

received her BA from Lycoming College, where she majored in French and ancient Near Eastern archaeology, 2011. She went on to earn an MA in linguistic anthropology from the University of Virginia in 2013, as well as an MA in Egyptian art and archaeology and a graduate certificate in GIS from the University of Memphis in 2015. Her first MA thesis examined the linguistic concept of diglossia and its relevance to the study of bilingualism in Ptolemaic Egypt. Her current research focuses on sensory archaeology and, more specifically, olfactory symbolism in Egyptian funerary contexts.

She attended her first excavation in 2009 in Mendes, Egypt, and then spent several summers working at Idalion in Cyprus and at Tel Megiddo East in Israel. She has also excavated stateside at Montpelier, Virginia, and has volunteered at an underwater archaeological survey in Menorca, Spain. While in Cyprus, she used GIS to create a photogrammetric map to enable visualization of the site by period. During the past year, she worked

as an intern at the San Diego Museum of Man, where she assisted in documentation and translation of the Egyptian collection.



**AMR KHALAF SHAHAT**

was born and raised in Egypt. He was inspired by the splendid monuments of his country and chose to pursue a career in ancient Egyptian history and archaeology. He took his BA in tourism, with a focus on archaeological tourism, at Helwan University in 2008. After his graduation, he worked as a tourist guide licensed in English, French, and Korean. After the Egyptian uprising in 2011, he was granted a scholarship from the History Department of the University of Memphis, where he completed his MA in Egyptology in 2015.

Amr is interested in ancient Egyptian food technology. His MA project focused on the ethnoarchaeology of ancient Egyptian cereal processing and bread making. At the University of Memphis, he was a team member of the Karnak Hypostyle Hall project in Luxor. He received departmental funding to join the field school on Egyptian ceramics of the Italian mission in Luxor. In 2013 he joined the UCLA team in Fayum, where he worked with Professor Willeke Wendrich on the planning of an open-air museum housing the relocated archaeological remains of Kiman Fares, a nearby Pharaonic site.

Before coming to UCLA, Amr started his PhD research in Memphis, where he was awarded an interdisciplinary certificate in museum studies in 2015. During the summers, he worked as an intern in the Charleston Museum, the oldest

museum in the United States. His tasks included identifying forgeries, providing the museum with the correct names and dates associated with Egyptian mummies and coffins, and creating temporary exhibits and programs for children and adults. He was also an intern and curatorial assistant with the University of Memphis Art Museum, where he helped store the Egyptian collection in preparation for a major renovation project.

During his tenure at UCLA, Amr plans to work on ancient food technologies, with a focus on ancient Egyptian granaries, technological changes of cereal production associated with demographic shifts, and their impact on health. He also wants to work on advocacy projects (in Egypt, Peru, and the United States) to protect and enhance the presentation of cultural heritage sites and museum collections. During his free time in Los Angeles, he would like to participate in an applied museum archaeology program used as activity therapy and an engagement tool for people with mental illnesses.



**KIRIE STROMBERG**

was born and raised in the Midwest. In 2012 she graduated with a BA in English language and literature from Yale University, where she also began her studies of Chinese under the auspices of the Light Fellowship. In her senior year, she researched the poetry of Tibetan Sino-phone writers and questions of cultural identity as they inform the works of these authors.

During her years at Yale, Kirie traveled to Beijing several times. After taking

### Incoming Graduate Students

*(continued)*

a course on the archaeology of China, she realized that her interests in texts and objects were more mutually beneficial than exclusive. In 2014 she received her MPhil in Chinese studies from Cambridge University, where she collaborated with curators at the Fitzwilliam Museum. Her thesis focused on Late Shang and Early Western Zhou ritual bronzes excavated along the borders of ancient China and on connections to the cultures of the “northern zone.”

Under the guidance of Lothar von Falkenhausen, Kirie intends to conduct further research on bronzes from the borders of the Zhou cultural sphere. She also hopes to perform ethnographic research on archaeology in mainland China and study the effects of ongoing excavation on local communities. Her goal is to pursue an interdisciplinary course of study bridging Chinese anthropology and archaeology, allowing for exploration of what ritual objects meant to the people who produced them, as well as what they mean for Chinese society today.

## Report from the Chair of the Conservation of Archaeological and Ethnographic Materials Interdepartmental Degree Program

*Ioanna Kakoulli*

THE UCLA/GETTY CONSERVATION of Archaeological and Ethnographic Materials (CAEM) Interdepartmental Degree Program (IDP) is a premier graduate degree program at UCLA. The program was originally established through a cooperative effort between UCLA and the Getty Conservation Institute and is academically linked to the Division of Social Sciences while being administratively housed in the Cotsen Institute of Archaeology. The CAEM IDP has the unique distinction of being the only graduate-level academic conservation program on the West Coast, as well as the only program in the world with a strong focus on archaeological and ethnographic materials. The mission of the program is to educate and train students in the highest standard of conservation practice and decision making and to prepare them to work as professionals in the preservation of archaeological and cultural materials.

The CAEM IDP is distinguished by its emphasis on materials, technologies, and cultural preservation closely associated with archaeological and ethnographic objects, including indigenous materials, rock art, wall paintings, and mosaics. Stressing the importance of working within a cultural context and as part





First-year graduate conservation students (from left) Marci Jefcoat Burton, Morgan Burgess, and Michaela Paulson determine what chemical methods to use for removing corrosion from coins.

of an interdisciplinary team, the program emphasizes the collaborative nature of conservation. A key goal is to enhance standards of conservation treatment and research through the application of both cultural understanding and scientific methods of documentation, examination, analysis, and practice.

The student experience is augmented by a range of collaborations with local museums, including teaching and research exchanges with the Getty Antiquities Conservation Department, the Getty Conservation Institute, the Fowler Museum, and the Los Angeles County Museum of Art. Other collaborations involve the study, characterization, and conservation of polychrome artifacts and ceramics from the Museum of Man in San Diego and preventive conservation issues for artifacts housed in the Natural History Museum of Los Angeles County. The program also regularly collaborates with indigenous Indian communities, serving as a much-needed resource for indigenous preservation. Such collaborations have included instruction on the preservation and care of tribal collections in

partnership with the Agua Caliente Cultural Museum, as well as research on approaches to the preparation and conservation of artifacts from California Indians.

Since its establishment in 2005, the CAEM IDP has contributed to the field of highly skilled conservators, with graduates of the program being offered permanent positions at prestigious institutions such as the Fowler Museum at UCLA, the National Air and Space Museum (Smithsonian Institution), the Newark Museum in New Jersey, and the Royal Museum for Central African Art in Brussels, Belgium.

### Accomplishments of CAEM IDP

*Ioanna Kakoulli*

THIS WAS ANOTHER EXCITING year for the UCLA/Getty Conservation of Archaeological and Ethnographic Materials (CAEM) Interdepartmental Degree Program. This year, faculty and students received prestigious honors and awards and contributed to the field with significant peer-reviewed publications, invited talks, national and international collaborations, and service to professional societies. With the graduation of the class of 2016, the program has reached a total of 38 conservation graduates since its inception in 2005, with the first class graduating in 2008 and each successive class every two years thereafter. CAEM graduates have been successful in obtaining leading positions and multiyear appointments at top-ranked museums in the United States and elsewhere, along with acceptance into PhD programs in allied fields. This is indicative of the high-caliber education provided by the program.

Our third-year students returned to the Getty Villa on June 3, 2016, to give their final presentations based on work done for their theses. Colette Badmagharian did internships at the Shangri La Center for Islamic Arts and Cultures in Hawaii and the Benaki Museum in Greece. The title of her thesis is “Piecing Together the History of an Eighteenth-Century Printed Armenian Prayer Scroll: The Study of Cultural Context and Manufacturing Techniques.” Elizabeth (Betsy) Burr worked at the Alaska State Museum and the Arizona State Museum. Her thesis is entitled “Dye Analysis of Archaeological Peruvian Textiles Using Surface-Enhanced Raman Spectroscopy (SERS).” Lesley Day did internships at the Hibulb Cultural Center (Tulalip, Washington) and the American Museum of Natural History to complete her thesis, “A Study of the Moiré Pattern of Tortoiseshell: Morphology of the Pattern, Techniques for Documentation, and Alterations of the Pattern and Shell by Accelerated Light Aging.” Tom McClintock worked for Stepwise Heritage and Tourism in Angkor Wat and the Conservation d’Angkor in Cambodia. The title of his thesis is “Documentation and Technical Study of Torqua Cave.” William Shelley did internships at the Gordion Archaeological Project

(Turkey) and the Laboratory of Archaeometry of the University of the Peloponnese (Greece) to complete his thesis, “Biocorrosion of Archaeological Glass.” Heather White worked at the Nelson-Atkins Museum of Art in Kansas City, Missouri. Her thesis is entitled “An Analysis of Unidentified Dark Materials between Inlaid Motifs on Andean Wooden Qeros.”

The Straus Center for Conservation and Technical Studies, Harvard Art Museums, hosted the Annual Meeting of the Association of North American Graduate Programs in Conservation on April 14–16, 2016. This year, CAEM participated with an oral paper by Colette Badmagharian, who presented “Eighteenth-Century Armenian Prayer Scroll: The Study of Cultural Context and the Characterization of Manufacturing Techniques.” Two first-year students, Marci Burton and Lindsay Ocal, presented in the lightning-round session on “3D Computed Tomographic Analysis of a Pre-Columbian Chilean Child Mummy Bundle” and “Analysis and Retreatment of an Archaeological Polychrome Ceramic Bowl from Amapa, Mexico,” respectively.

Faculty and staff of CAEM also had a successful year. David Scott published *Art: Authenticity, Restoration, Forgery* (Cotsen Institute of Archaeology Press), and Vanessa Muros received the 2016 Staff Assembly Scholarship for professional development from the UCLA Retirees Association. Ioanna Kakoulli received the inaugural visiting professorship in archaeological materials science from the Department of Materials Science and Engineering at the Massachusetts Institute of Technology.

Another exciting development was a proposal for a new PhD program on the conservation of material culture to be offered along with the existing MA program. The program is expected to launch in 2017 to coincide with the new cohort of students. This is an important milestone for CAEM and UCLA, as it will be the only program of its kind, not only in the UC system but nationwide.

Additional information can be found at <http://conservation.ucla.edu/>.



### Mesoamerican and Contemporary Mexican Featherwork Events

For a week during the spring quarter of 2016, the Cotsen Institute of Archaeology hosted Mexican scholar María Olvido Moreno Guzmán, who specializes in Mesoamerican and contemporary Mexican featherwork. During her stay in Los Angeles, Moreno Guzmán offered three talks and a Q&A session accompanying the screening of a documentary. The first talk was presented as part of the 2016 Cotsen Institute of Archaeology Open House and was entitled “Secrets of the Feather Headdress Known as Penacho de Moctezuma.” In this lecture, Guzmán showed the audience the complexity of the construction technique of the ancient Mexican feather headdress, which is housed in the Weltmuseum in Vienna.

Her second talk, “Contemporary Mexican Featherwork: An Ancient Tradition,” examined the featherwork production of the late twentieth and early twenty-first centuries in Mexico, a tradition that she argues should be considered part of the evolution of this art form. Moreno Guzmán presented a third lecture, at the Getty Villa, with the title “Conservation of the Sixteenth-Century Feather Headdress Known as Penacho de Moctezuma,” in which she focused on the results of a binational project in Mexico and Austria regarding the documentation, scientific study, and preservation of the object. The final event was the screening of the award-winning TV-UNAM documentary *El Penacho de Moctezuma: Plumaria del Mexico Antiguo*, in which Moreno



María Moreno Guzmán cleans the Penacho de Moctezuma.



María Moreno Guzmán and Melanie Korn work on the featherwork headdress known as the Penacho de Moctezuma in the Weltmuseum in Vienna.

Guzmán and other specialists discuss the history, technology, scientific research, and myths about this iconic featherwork piece. These events were generously sponsored by the Cotsen Institute of Archaeology, the UCLA-Getty Conservation

Interdepartmental Program, and UCLA's Latin American Institute and Center for Mexican Studies.

— Karime Castillo

### The Sixth Annual UCLA Interdisciplinary Archaeology Research Conference

Questions regarding identity have been part of archaeology for a long time, and changing conceptions of identity require archaeologists to return continuously to the subject for critical analysis through new perspectives. Identity can be expressed in a variety of ways, including language, foodways, architecture, bodies, and differential use of space. Archaeology provides a unique way to correlate the expressions of

As before, conference organizers (Brandon Braun, Karime Castillo, Adam DiBattista, Tao Shi, Reuven Sinensky, and Debby Sneed) invited a group of outstanding graduate students working in a variety of fields, including archaeology, anthropology, bioarchaeology, physical anthropology, and Egyptology, to discuss issues related to identity and personhood in the past from different perspectives.

The conference was held

Raising ideas related to experiential archaeology, as well as historical and comparative perspectives, she pointed out possible future directions for the archaeology of human experience at the conclusion of her talk.

On Saturday, eleven graduate students presented their papers in four panels organized under the themes “ascribed identity,” “burgeoning identity,” “self-identification and representation,” and “identity in space.” Priscilla Mollard (University of Massachusetts–Amherst) and Sarah Baitzel (UC San Diego) demonstrated how mortuary practices were used to assert the otherness in medieval apotropaic burials and in Tiwanaku communities of the south-central Andes, respectively. Through the study of mitochondrial DNA, Ana Morales (University of Calgary) traced population movements from Mesoamerica to lower Central America from A.D. 800 to 1350, while Tao Shi (UCLA) used archaeobotany to study populations and agricultural strategies in southwestern China from around 1200 to 250 B.C. Sarah Striker (Arizona State University) explored the emergence of collective identities and the development of social cohesion in Ontario over a period of 150 years by assessing the decorative styles and production techniques of ceramics through macroscopic and microscopic observations. Marissa Stevens (UCLA) examined funerary papyri from the Twenty-First Dynasty of ancient Egypt and argued that about half of the



University of Chicago graduate student LaShaya Howie presents her research on the African Burial Ground in New York City during the Sixth Annual UCLA Interdisciplinary Archaeology Research Conference.

identity with material culture, to explore how different identities are constructed, and to contribute to discussions related to the meaning of identity and personhood in the past and the present. The Sixth Annual UCLA Interdisciplinary Archaeology Research Conference: *Fitting in or Opting Out: Understanding Identity and Personhood in the Past*, provided a stage for graduate students to explore the complexities of individual, group, and community identity in the past.

February 5–6, 2016, beginning on Friday evening with a keynote lecture by Michelle Hegmon entitled “The Archaeology of the Human Experience.” Hegmon proposed the archaeology of human experience as a means to understand what it was actually like to live in the past. After explaining the origins and goals of the archaeology of human experience, Hegmon presented three examples—from the American Southwest, the Inca Empire, and Nazi labor camps.



papyri assemblages represented women. This, combined with the new freedom of choice in their content, has led to novel ways of illustrating social identity through funerary material culture.

LaShaya Howie (University of Chicago) argued that the African Burial Ground in New York City was a crucial nexus for the burgeoning African American identity and has been a sacred site for the formation of black identity. Aviva Cormier (Boston University) explored how dwarfism, disability, and impairment were perceived in the lower Illinois Valley during the Middle Woodland period, as well as the role of disability in the construction of diverse identities in the past. John Willman (Wash-

ington University) examined dental wear among the Gravettian peoples of central Europe and the Russian Plain in the Upper Paleolithic and argued that wear on buccal facets was related to the use of labrets as markers of social identity and life transitions. Kirby Farah (UC Riverside) examined elite household architecture and artifact assemblages in Post-Classic Xaltocan, Mexico, to explore negotiation of the dual identities of local leaders and members of a regional elite class. Marijke Stoll (University of Arizona) and Elizabeth Konwest (Indiana University) examined how ethnic identity was realized and negotiated in Nejapa, a frontier zone in Oaxaca, Mexico.

Finally, Alan Farahani linked

the contributions of each paper to our understanding of identity and personhood in the past and presented his own insight into the matter. The conference was generously funded by the Cotsen Institute of Archaeology, the dean of humanities, the dean of social sciences, and the Graduate Students Association of UCLA. In the future this conference will be held every other year. We look forward to another exiting conference in 2018.

— *Tao Shi and Karime Castillo*

## Pizza Talks of the 2015–2016 Academic Year

The fall quarter Pizza Talks began with a refreshing focus on research in the New World and featured a mix of academic and commercial consulting perspectives. James Potter (senior archaeologist at PaleoWest Archaeology) gave a dramatic start to the series with his talk “Conflict and Treachery in the Sacred Ridge Community, Southwest Colorado,” which explored the formation, development, and dissolution of an early pre-Hispanic community based on evidence of local violence and conflict. Karl Taube (UC Riverside) followed with a presentation of new ideas regarding avian and floral imagery in friezes of Chichen Itza in his talk “The

Birth of Ehecatl and the Origins of Cacao: The Initial Series Group at Chichen Itza, Mexico.” David Scott (UCLA) spoke about the importance of proper contextualization in “Art Restoration and Its Contextualization.” John Dietler (program director of SWCA Environmental Consultants) presented the results of his work at Mission San Gabriel in a talk entitled “A Huge Beehive of Industry: Native American Work and Life at Mission San Gabriel, California.” The geographic focus of the talks then moved westward to Asia and finally Europe. Mauricio Hernan-

dez (postdoctoral scholar, Cotsen Institute) presented the preliminary results of his research in a talk titled “Ecology, Subsistence, and Cultural Admixture: A Bioarchaeological Perspective of Community Health along Northwest China’s Prehistoric Trade Networks,” and Henry Colburn (Getty Scholar, Getty Research Institute) discussed issues of identity in “Interrogating Identities in Achaemenid Egypt.” Susanna McFadden (Getty Scholar, Getty Research Institute) discussed fascinating artistic findings in “A Study in Plaster: Archaeology, Conservation, and Late Roman Visual



The removal of a large architectural element from the excavation unit in the forum at Zita (Tunisia) as discussed by Ali Drine.

## Pizza Talks (continued)

Culture in Egypt's Dakhleh Oasis." John Papadopoulos (UCLA) ended the year with a grand finale that summarized his and Sarah Morris's latest research: "The Ancient Methone Archaeological Project: The First Two Years."

The winter quarter Pizza Talks began with a question-and-answer-style forum with Colin Renfrew (senior fellow of the McDonald Institute for Archaeological Research, Cambridge) and Jane Renfrew (emeritus fellow at Lucy Cavendish College, Cambridge), who touched on a variety of topics, including the development of paleoethnobotany and the protection of cultural heritage. Tom Garrison followed with an exploration of a LIDAR method for detailed architectural modeling in his talk "Tunneling with Technology: Recent Investigations at the Classic Maya Site of El Zotz, Guatemala." Michael Frchetti (Washington University) offered "Uncovering a Lost City of the Qarakhanid Empire: Alpine Urbanism in Medieval Uzbekistan." Frchetti presented a fascinating portrait of a medieval kingdom; his research offers a compelling addition to the field of Eurasian archaeology. Cotsen faculty member Giorgio Buccellati presented a retrospective of his work in Syria and offered a startling portrait of the management and protection of cultural heritage in a region constantly under threat from ISIS. The quarter also featured two talks on ancient Greece. In "Transport Amphorae, Symposia, and Early Iron Age Economies," Mark Lawall (University of Manitoba) showed how the Greek cultural practice of the symposium has a much larger connection to the ancient Mediterranean world. Ioannis Mylonopoulos (Columbia University) detailed an archaeological project in Boetia

in a talk entitled "Excavations at the Sanctuary of Poseidon in Boeotian Onchestos (Greece). Report on the First Two Campaigns." Other talks highlighted the range of methodologies used in archaeology. Sara K. Becker (UC Riverside) presented "Bone Wary: Labor in the South American Tiwanaku State (A.D. 500–1100) from a Bioarchaeological Perspective," in which she focused on health, pathology, and disease in Tiwanaku. Erik Gjeseld (UCLA) gave a talk entitled "Modeling Strategies of Risk-Reduction in the Kuril Islands," in which he showcased how statistical methods such as principal components analysis can be used to study movement in ancient Japan.

In the spring quarter we had nine Pizza Talks, many from familiar faces. UCLA speakers included alumni, research partners, professors, and especially PhD candidates, with the aim of keeping the Cotsen community updated on one another's research. Ali Drine (senior research fellow, Institut National du Patrimoine) began the spring talks with "The Ancient Site of Zita in Southern Tunisia," which explored the Carthaginian origin and Punic identity of the site and its inhabitants. The Zita project is a collaboration between the Institut National du Patrimoine, UCLA, and Brown University. James Brady (CSU Los Angeles), in a return to UCLA, where he earned his PhD, followed with a presentation of his restudy of the caves of Quen Santo, a site studied by Eduard Seler at the end of the nineteenth century. His talk was titled "Nineteenth-Century Archaeology Meets Sacred Landscape: A Second Look at Quen Santo." Marilyn Kelly-Buccellati (UCLA) presented her research in Georgia in her talk "The Centrality of the Outer Fertile

Crescent: A View from Aradetis Orgora." Jacob Bongers (PhD candidate, UCLA) presented his research on mortuary practices in the mid-Chincha Valley of Peru, a collaborative project with Brittany Jackson and Terrah Jones. His talk was titled "Inca Imperialism and Local Mortuary Practice in the Mid-Chincha Valley, Peru." Scott Fitzpatrick (University of Oregon), in his talk "Currents and Commodities: How Oceanographic Effects Influenced the Prehistoric Colonization of Islands," presented his research on the Caribbean and environmental conditions that impacted the colonization of islands. Merrick Posnansky (UCLA) presented "Black Lives Matter: Reflecting on the Development of African American and African Diasporan Archaeology," a talk on the history and growth of African American archaeology since the 1940s. Marianna Nikolaidou (research associate, UCLA) presented pottery from the Neolithic to the Early Bronze Age in ancient Methone in a talk titled "Pars pro toto: Prehistoric Pottery Fragments and Archaeological Narratives at Ancient Methone, Northern Greece." In her talk "Ceramics from Mai Adrasha, Ethiopia: A First Look at the Western Highlands," Rachel Moy (PhD candidate, UCLA) spoke about new UCLA excavations in Shire, Ethiopia, which she codirects with Willeke Wendrich. Ben Nigra (PhD candidate, UCLA) wrapped up the spring Pizza Talks with "Soto: 2,300 Years of Evolving Ritual Architecture and Practice at a Monumental Paracas Huaca."

— Adam DiBattista, Anna Bishop, Brandon Braun, Danielle Candelora, Karime Castillo, and Georgi Kyorlenski



## Friday Seminars of the 2015–2016 Academic Year

The 2015–2016 academic year saw another successful round of Friday Seminars by esteemed scholars on a variety of topics. We started off the year with a presentation by Edward Pollard of the British Institute in East Africa in a talk entitled “Why Land Here? Second-Millennium A.D. Ports and Harbors in Southeast Tanzania.” Pollard presented the results of an underwater survey in Kilwa Kisiwani Harbor in Tanzania. Through the use of sonar, his team identified the ballast of foreign ships. When used as a proxy for shipwrecks, this ballast provides an indication of how the harbor was managed during the colonial period. The second talk of the series was given by Adam Watson from the American Museum of Natural History. He discussed the emergence of social inequality and power in Chaco Canyon in his lecture “Power and Exotica: Pre-Columbian Exchange and Social Transformation in Chaco Canyon.” Watson presented new radiocarbon dates from the remains of macaws recovered from Chaco Canyon; the dates indicate early importation of the birds from Mexico. Our final talk of the quarter, “Historical Counterfactuals in Archaeological Reasoning,” was given by Derek Turner of Connecticut College. Turner, a professor of philosophy and associate director of the Goodwin-Niering Center for the Environment, led an epistemological discussion of how scientists view the past and the role

of counterfactual claims in forming and assessing our interpretations.

During the winter quarter, Li Liu of Stanford University presented a number of new methodological approaches to the study of plant domestication in her talk “Plant-Based Subsistence Strategies and Development of Complex Societies in Neolithic Northeast China: Evidence from Grinding Stones.” This was followed by an engaging multidisciplinary treatment of the Comanche by Severin Fowles of Columbia University. In his lecture “Comanche Visual Culture and the Theater of War,” he discussed using archaeology, ethnography, and the study of rock art to more completely examine Comanche society. Caroline von Nicolai, a visiting scholar at UC Berkeley from Ludwig-Maximilians-Universität München, lectured on “Long-Distance Networks in Neolithic Europe.” She explained how she utilizes the proxy evidence of imported stone to map trade networks and to study social complexity throughout the Alpine regions of Europe. Her talk was followed by an excellent theoretical discussion of the nature of entanglement by Ian Hodder of Stanford University. In “Epistemological Issues Raised by Theories of Entanglement,” he explored several models to illustrate the complex possibilities of explanation via entanglement theories. Finally, Alexis Boutin of Sonoma State University delivered the lecture “Stories from



Emily Lindsey excavates Pleistocene megafauna fossils in southwestern Ecuador.

the Skeleton: Masculinity, Old Age, and Disability in Ancient Bahrain,” which demonstrated the capacity for bioarchaeology to personalize the stories of individuals from the ancient world.

The spring series began with Emily Lindsey from UC Berkeley, who posed several thought-provoking questions about early man in her talk “Human–Environment Synergies in Driving Late-Quaternary Megafaunal Extinctions in South America.” Heather Miller from the University of Toronto spoke about how technologies arise and transform in “Motivations and Mechanisms in Technological Change: Examples from the Talc-Faience Complexes of the Indus Valley Tradition,” while Cathy Costin from CSU Northridge continued the discussion of technology with her lecture “Pottery as Infor-



## Friday Seminars (continued)

mation Technology on the North Coast of Andean South America.” In his talk “Archaeological Expedition to Sinop, Turkey: Exploring the Origins of Trade at the Nexus of Eurasian Civilizations,” Owen Doonan, also from CSU Northridge, spoke about his most recent fieldwork. Thomas Schneider from the University of British Columbia ignited a heated discussion about how history is written with “What Is the Past but a Once Material Existence Now Silenced? Understanding the Archaeology and History of Egypt’s First Intermediate Period.” Finally, Jorrit Kelder from the Oriental Institute at Oxford University, a visiting Getty Scholar, spoke about the movement of objects in the early Mediterranean in his talk “Mycenae, Rich in Silver: Silver, Gold, and Maritime Trade in the Early Mycenaean World.” Overall, faculty, staff, students, and friends of the Cotsen Institute enjoyed another year of thought-provoking lectures.

— *Caroline Arbuckle MacLeod, Kate Bishop, Jacob Damm, Ben Nigra, Stephanie Salwen, and Chenghao Wen*

## Wep-Waut 2016: Ancient Technology: The People behind the Products

On May 15, 2016, undergraduate and graduate students at UCLA presented a series of talks on ancient Egyptian technologies at the annual conference Wep-Waut in Westwood. Willeke Wendrich, the founder of the conference and the current Joan Silsbee Chair of African Cultural Archaeology, delivered the keynote address and explained that Wep-Waut is an ancient Egyptian jackal deity known as “the opener of the ways.” The students echoed this concept in the many ways they addressed a wide spectrum of ancient Egyptian technologies. This year’s theme was “the people behind the technology.” Students not only explored ancient production techniques and technologies but also tried to understand the individual craftspeople and consumers involved in these processes.

During their talks, students addressed the study of technology in multiple ways. Several papers examined and reconstructed individual steps in ancient technical processes. Some students adopted multiple research strategies to explore and present technology, while others focused more heavily on exploring the roles of ancient artisans and craftspeople in society. Graduate student Vera Rondano and undergraduate student Sam Gonzalez presented various ways of creating faience vessels and figurines. Rondano and Gonzalez

took the audience through each step required to create these items; their talks (“Potters and Pottery” and “The Prestige of Color in Faience Production”) conveyed the complexity underlying the manufacture of both luxury and everyday objects. In his talk “Worked Bone and Ivory at Ancient Methone,” graduate student Adam DiBattista presented a collection of bone and ivory artifacts from the ancient Greek site of Methone, exploring how producers’ techniques and choices related to the social environment of craftspeople at the site.

Other presentations showed how technology forms a crucial component of much bigger discussions about large-scale cultural trends. Graduate students Danielle Candelora and Nadia Ben-Marzouk explored how technology relates to interactions between cultural groups; their talks (“The Role of Foreigners in Transmitting Technology” and “Reassessing the Function of ‘Duckbill’ Axes”) focused on the transmission of technologies between Egyptians and foreigners, highlighting how technology studies offer a valuable means of learning about group identities.

Presenters then showed that many different processes can constitute a specific technology. In his talk “Time and Timekeeping in Ancient Egypt,” graduate student Luke Breinig explored how Egyptians understood and recorded



time. Breinig asserted that the idea of timekeeping is a technology in itself, one that relies on many bodies of knowledge and other forms of technical skill. Undergraduate student Ceanna Van Eaton focused on a very tangible technology essential to many of the monumental structures still standing in Egypt today. Her talk “A Comparison of Quarrying” explored how stone for statues and monuments was procured, looking at the aesthetic and structural qualities of multiple types of stone at two different quarries in Egypt.

Graduate students Carrie Arbuckle MacLeod (“People in Production”) and Idi Okilo (“Contextualizing a Funerary Stela”) showed videos of present-day Egyptian craftsmen doing carpentry and stone carving. They provided insightful commentaries that highlighted both the personalities behind these crafts and specific aspects of professional technique. Although these videos showed modern individuals, the speakers emphasized issues of technology pertinent to all time periods. In addition to capturing and studying videos of modern craftspeople, many students conducted experimental archaeology in an effort to understand and reconstruct ancient technologies. Experimental archaeologists attempt to re-create ancient production techniques by physically handling raw materi-



Wep-Waut participants in front of the Cotsen Institute after their talks in the amphitheater. Willeke Wendrich is holding the virtual jackal standard based on ancient Egyptian examples.

als. Some students have received hands-on training from experienced professional craftspeople, including carpenters, metalworkers, and spinners. Recent UCLA graduate Heidi Hilliker joined the Greater Los Angeles Spinning Guild to study Egyptian flax production. For her study (“People in Production”) Hilliker experimented with a drop spindle and a ceramic bowl containing water to replicate techniques used by ancient Egyptians. She said, “Experimenting with ancient technology taught me that there is a significant difference between having an idea of how an object might function and the sensory knowledge gained by experiencing how an object does function.”

The work of Hilliker and other students at the conference highlights the importance of presenting experimental approaches to the

public. Experimental archaeology allows for a deeper understanding of the skill, time, and bodily movements involved in the production of the finished artifacts encountered in museums. The talks from Wep-Waut in Westwood made it clear that the archaeological study of technology encompasses a variety of very different subjects and approaches. UCLA students embodied the spirit of the god Wep-Waut by showing the audience the many ways that technology impacted the lives of ancient Egyptians.

— Danielle Candelora  
and Adam DiBattista

# Cotsen Institute of Archaeology Open House 2016



The Southwestern Laboratory with Gregson Schachner and graduate students Reuven Sinensky and Kate Bishop.



The Egyptology Laboratory with graduate students Jacob Bongers, Idi Okilo, and visitors.



Volunteer Kay Hullett with curious children in the Zooarchaeology Laboratory.



Judy Porcasi displays decorated monkey skulls in the Zooarchaeology Laboratory.



Stephen Acabado dispenses kava, a Polynesian drink made of *Piper methysticum*, to graduate student Jacob Bongers in the Southeast Asian Laboratory.

A visitor in the Conservation Laboratory.





# COTSEN COMMUNITY EVENTS

Volunteer William Orrange instructs visitors in the Mesopotamian Laboratory.



Professor emeritus James Sackett displays stone tools to young visitors in the Old Stone Age Laboratory.



The Cotsen Institute comprises laboratories, archives, offices, and common rooms. The people working in these areas include faculty, graduate students, staff, and volunteers. Research at the institute covers many countries, cultures, and time periods. The breadth of the research areas is truly impressive. Our laboratories include the Agriculture, Anatolian, Andean, Armenian, Ceramics, Channel Islands, Classical, Conservation, Digital Humanities, East Asian, Egyptian, Mediterranean, Mesopotamian, Rock Art, South Asian, Southeast Asian, Southwestern United States, Stone Age, and Zooarchaeology Laboratories.

One day per year, at the annual Open House, everyone at the institute comes together to proudly show the public what transpires here. This year saw our nineteenth Open House. Among our visitors were schoolchildren, undergraduate students, and curious adults. We hope that young visitors in the group left inspired to read more about archaeology and that adults left wishing they had studied the discipline and now would like to support ongoing research.

— Helle Girey



Graduate students Evan Carlson and Hannah Lau in the Anatolian Laboratory.

Christian Fischer in the Conservation Laboratory with Cotsen Institute staff member Matthew Swanson.



John Papadopoulos shows visitors pottery in the Classical Laboratory.





## Cotsen Institute of Archaeology Public Lectures

The Cotsen Institute sponsors a number of public lectures every year. These lectures are free to the public and offer an opportunity to meet people who share common interests. In January 2016 we were honored to hear Colin Renfrew, senior fellow of the McDonald Institute for Archaeological Research at the University of Cambridge, present “Indo-European Origins Revisited: New Data, New Problems.” Renfrew explained that the image of mounted nomadic warriors from the steppe lands of Russia bringing the Proto-Indo-European language to Europe had been replaced in recent years by new models, with the spread of farming from Anatolia becoming a preferred explanation for language replacement. Recent work on ancient DNA, however, has brought the steppe theory back into prominence. As Renfrew discussed, the Indo-European question remains controversial and will be reviewed again, but perhaps will never be resolved.

In March the Cotsen Institute, in cooperation with the Institute for Field Research, presented “Medieval Ireland: An Overview of 1,000 Years from the Archaeological and Historical Record,” a lecture by Stephen Mandel, vice chair of the Royal Irish Academy Committee for Archaeology. Mandel explained that the medieval period in Ireland is often defined in terms of specific events, from Saint Patrick lighting the Pascal fire to bring Christianity in A.D. 432, to the first Viking raids on Lambay Island in 795, to the Anglo-Nor-



The central part of the ancient Mexican feather headdress known as El Penacho de Moctezuma.

man invasion led by Strongbow in 1169. While these dates dominate the discourse, they represent a simplistic classification and take focus away from a more complex story. Mandel presented an overview of the medieval history of Ireland through the archaeological and historical record, demonstrating that this small island nation has always held significance far greater than its size.

In conjunction with the annual Open House in April, the Cotsen Institute was pleased to introduce María Olvido Moreno Guzmán of the Institute of Aesthetic Research

at the National Autonomous University of Mexico. Coordinator of the Pre-Hispanic Mural Painting Project, she spoke on the “Secrets of the Feather Headdress Known as Penacho de Moctezuma.” This ancient Mexican artifact is kept in the Weltmuseum in Vienna. It is the most renowned of the few remaining featherwork objects from pre-Columbian Mesoamerica. It was made according to a detailed construction plan and combines nine different manufacturing techniques that highlight the optical qualities of the iridescent feathers and the luster of the



golden applications. The complexity of the construction brings to the fore a centuries-old tradition of featherwork technology developed by various cultural groups in Mesoamerica.

The May public lecture was cosponsored by the Archaeological Institute of America, the Ahmanson Foundation, and the Fowler Museum. It coincided with *Art of the Austronesians*, a special exhibition in the Fowler Museum. Scott Fitzpatrick of the Department of Anthropology, University of Oregon, spoke on “Stones of the Butterfly: Archaeological Investigation of the Yapese Stone Money Quarries in Palau, Micronesia.” For centuries, people from the island of Yap in the western Pacific voyaged south to the Palauan archipelago to quarry their famous stone money in limestone caves. The stone disks—called *rai* or *fei*—measure up to 4.5 m in diameter and weigh more than 8 metric tons each. They were carved almost exclusively in the “Rock Islands” of Palau and then transported by oceangoing canoes or European trading ships back to Yap Island, almost 400 km away. Fitzpatrick discussed how archaeological research in Palau adds a new dimension to understanding how these megaliths were quarried and moved over jagged karst terrain and across the sea. He also highlighted the importance of stone money in Micronesian inter-island exchange systems.

— *Helle Girey*

## Friends of Archaeology Dinner Lectures

Friends of Archaeology dinner lectures bring to members a wealth of topics on archaeology from around the world, with a combination of good food and wine, a convivial audience, and outstanding archaeological presentations. On October 13, 2015, Thomas Levy, distinguished professor of anthropology and the Norma Kershaw Chair of the Qualcomm Institute at UC San Diego, presented new insights into the Iron Age archaeology of biblical Edom, Jordan. The past 14 years of a large deep-time study (spanning Neolithic to medieval Islamic times) of ancient mining and metallurgy in Faynan copper ore mines in Jordan have been devoted to the Iron Age (circa 1200–500 B.C.E.). This is the period most closely linked to the Hebrew Bible and is when the first local, historical, state-level societies emerged. In his discussion of this period, Levy also addressed intriguing issues related to the historicity of David and Solomon in this part of the southern Levant.

On January 28, 2016, Anthony Aveni, Russell B. Colgate Professor of Astronomy and Anthropology at Colgate University, spoke on new discoveries from Maya excavations relating to astronomy. Archaeoastronomy is an interdisciplinary study that combines looking

down with looking up—in this case looking at wall inscriptions recently revealed at Xultun in the Maya Petén region that prove that Maya astronomers were predicting eclipses hundreds of years earlier than previously thought.

The last dinner lecture was on May 3, 2016, when Willeke Wendrich, the Joan Silsbee Chair of African Cultural Archaeology and professor of Egyptian archaeology, introduced the audience to the first UCLA excavation season in Mai Adrasha, Ethiopia. On the high plateau where the Blue Nile originates lies Mai Adrasha, an ancient town at the crossroads of trade routes between the Nile Valley and the Red Sea. This is where the latest archaeological project of the Cotsen Institute focuses on ancient trade and state formation.

— *Helle Girey and Jill Siltan*

# COTSEN COMMUNITY EVENTS

## A Farewell to the Old and a Welcome to the New Director of the Cotsen Institute

Margit Cotsen presents the inscribed trowel, the institute's highest honor, to Chip.



Alessandro Duranti, dean of social sciences, opens the official part of the program with a speech thanking Chip and welcoming Willeke.



Graduate students Georgi Kyorlenski and Ben Nigra enjoy a beer before the beginning of the ceremony.



The inscribed trowel.



Chip thanks all those present for 15 wonderful years.

On Monday, May 23, 2016, the Cotsen Institute held a reception to celebrate the directorship of Charles (Chip) Stanish and to welcome Willeke Wendrich as new director of the institute. The dean of social sciences, Alessandro Duranti, and former director Christopher Donnan thanked the outgoing director for all he accomplished during his 15-year tenure. Margit Cotsen graced the occasion with her presence and handed Chip an inscribed trowel, the highest recognition the institute can bestow. Chip then passed the torch to Willeke, who in her maiden speech accepted the directorship and presented some of her vision for the institute. Next the guests raised a toast, and the afternoon on the Fowler Terrace turned very pleasant indeed.

— *Hans Barnard and Sonali Gupta-Agarwal*





Willeke accepts the directorship and presents her vision for the future of the institute.

A good time is had by all.



Cotsen Institute core faculty members Sarah Morris and Stella Nair in deep conversation.



Professor emeritus Chris Donnan reminisces about the past and reflects upon the future.



Incoming director Willeke Wendrich with Helle Girey, flanked by former directors Merrick Posnansky and Jim Sackett.



Cotsen Institute donors Bruce Hector and Debby Arnold.



Outgoing director Chip Stanish with some Friends of Archaeology. Left to right: Kay Hullett, Mercedes Duque, Marillyn Holmes, and Helle Girey.



Elizabeth Brooks, former director of humanities and social sciences at the UCLA Extension Program; Elizabeth Kahn, RBMVE-Onward! and the J. Paul Getty Trust; Marina Belozerskaya, senior writer of Health Sciences Development; and David Schaberg, dean of humanities.



Lori Negosian, the youngest guest by far.



## A Thank-You to Helle Girey

Helle with Marla Berns, director of the Fowler Museum, and other celebrants.  
(Photograph by Richard Rafferty)



The celebrants listen to Merrick Posnansky, former director of the Cotsen Institute.  
(Photograph by Richard Rafferty)

A smiling trio: Tobias Dusette, chief administrative officer; Amber Cordts-Cole, Conservation Program coordinator; and Tanja Hrast, office coordinator.  
(Photograph by Richard Rafferty)



Helle Girey, director of public programs and so much more, was celebrated by the Cotsen Institute with a retirement party on May 9, 2016, at the Davis Courtyard in the Fowler Museum. With a touch of sadness at her departure, friends and colleagues thanked her for her dedication and hard work, and with happiness, they recalled glimpses of her 30 years with the institute. Good wishes were offered for her retirement, during which Helle will further explore her interests in archaeology and travel.

— Jill Silton



Professors Christopher Donnan, David Scott, and Merrick Posnansky in discussion.  
(Photograph by Richard Rafferty)



Shannon McGarry, assistant dean of the Herb Alpert School of Music, and Randi Danforth, director of publications.  
(Photograph by Richard Rafferty)



# COTSEN COMMUNITY EVENTS



Professors John Papadopoulos and Dwight Reed in conversation.  
(Photograph by Richard Rafferty)



Cotsen graduate student Rose Campbell and Willeke Wendrich, current director of the Cotsen Institute.  
(Photograph by Tanja Hrast)



A table conversation with Jill Silton, Shannon McGarry, Willeke Wendrich, Charles Stanish, and Helle.  
(Photograph by Tanja Hrast)



A table with a guest book and thank-you poster for Helle.  
(Photograph by Tanja Hrast)



Former director Charles Stanish hugs Helle after thanking her in his speech.  
(Photograph by Richard Rafferty)

## Interview with Willeke Wendrich, New Director of the Cotsen Institute

*Rachel Moy*

WILLEKE WENDRICH IS A professor of Egyptian archaeology in the Department of Near Eastern Languages and Cultures and holds the Joan Silsbee Chair of African Cultural Archaeology. In 2016, she was appointed director of the Cotsen Institute of Archaeology. Willeke is also editorial director of the Cotsen Institute Press, editor-in-chief of the UCLA Encyclopedia of Egyptology, director of the Center for Digital Humanities, and chair of the board of directors of the Institute for Field Research. She is codirector of the Fayum Project, Digital Karnak, the Keck Program in Digital Cultural Mapping, Ancient Egypt Architecture Online, and, most recently, the UCLA Shire Archaeological Project in Ethiopia.

**Rachel Moy:** First of all, congratulations on your new position as director. I want to talk a lot about that, but can you first discuss your existing positions and your roles in each.

**Willeke Wendrich:** I am a professor of Egyptian archaeology, and in my work I have become increasingly involved in digital research. The second year that I was at UCLA, I started developing the UCLA Encyclopedia of Egyptology (UEE), which is a digitally born project. Through that work, I came into contact with many people at UCLA with similar interests. It was really intriguing, because they came from all over campus. There were staff members of different technological organizations, faculty, students, and staff members in different departments. The nice thing about digital work is that independent of the disci-

pline, there is a lot to consider, discuss, and develop together. It is a very collaborative community. Because archaeology is also inherently collaborative, it is an environment I thrive in. I really enjoy being part of those two communities.

Digital humanities forms a link between North and South Campus, between humanities, social sciences, art, architecture, and computer science. It is not just about doing things online, but it is a completely different way of dealing with information. The questions are not only related to the content but also on how information is made available. What does it mean when we look at information spatially, or in three dimensions? How can we make our findings available in different ways, and what is the consequence for perception? These are all questions that are also part and parcel of archaeology, because as archaeologists we work with many different types of information: in maps, drawings, forms, notebooks. The management of all those disparate parts of information is now going digital, with the result that we have to deal with many different file types. We need to think about how we work with data, how our field experience translates to digital, how we present and share data. These questions become increasingly important. The digital work has three major sides: content, programming, and the bigger theoretical questions. How do you access information and what does it mean that you can get broad swathes of information and potentially combine them? How do we preserve that information for eternity? (We archaeologists think long term.)

I was asked three years ago to become director of the Center for Digital Humanities (CDH). In that





Figure 1. Willeke overlooks the Old City of Aleppo, Syria.

position, I have really been pushing the center to a broader collaborative effort, working closely with the library and the Institute for Digital Research and Education. This summer, after the end of those three years, I was asked by the dean of humanities to stay on for another year. As I had just become director of the Cotsen Institute—another large and vibrant institution—I agreed to a limited number of transitory tasks. My main purpose at CDH this year will be to help shape a more centralized North Campus effort, where digital humanities is really positioned where it belongs: between all the different divisions that are involved in digital scholarship. This includes not only humanities but also social science, art, and architecture; the new school of music and theater; film; and television. My task will be to provide the vision and assistance to make that change happen, rather than the daily business of CDH.

**RM:** You certainly mention a lot of positions: director of CDH, editor of the UEE project, director of the Cotsen Institute. Anything else?

**WW:** I am also chair of the board of the Institute for Field Research (IFR) and on a few other boards. At IFR I am much more involved with the day-to-day affairs in support of the executive director.

**RM:** I'm curious: Because IFR is not directly linked to UCLA, how do you see your work there relating to what you do on campus?

**WW:** IFR has deep roots at UCLA and is connected through UCLA Extension, which gives credit for IFR field schools. There are many UCLA faculty that run their field schools through IFR, and there is a new initiative with faculty from the Department for Ecology and Evolutionary Biology to initiate ecological field schools in which several UCLA faculty are involved. It is a great opportunity for students at UCLA, but also worldwide, to be directly involved in field research. IFR is focused on giving undergraduate students the opportunity to learn things in practice and be directly involved in hands-on field research.

**RM:** That ties in nicely to what I wanted to ask next, about your field research. You spent many years directing the project at Berenike and the Fayum Project in Egypt. I was curious about the state of the Fayum Project and where you see the project going in the future?

**WW:** The Fayum Project has reached a point in which we have a good overview of those aspects that were not addressed by the previous investigations there. There are two main foci of the Fayum Project, both related to ancient agriculture. One is the Neolithic research, where we worked in the area where the earliest evidence for agriculture in Egypt was found. The other is the Greco-Roman agricultural endeavors,

resulting in products such as grain, olive oil, and safflower oil, contributing to Ptolemaic and later Roman policies in the eastern Mediterranean. The Neolithic fieldwork has become increasingly difficult because of security issues. Attacks and kidnappings in the desert, though not where we are working, have made the security service in Egypt very nervous. There is also enormous ongoing destruction. The work we have done between 2005 and 2010 would not be possible now, because there is continuous illegal digging with huge machines. The Egyptian government furthermore built a new highway right through that region. We were really just in time with what we did. We would have liked to do more, but in the present circumstances, I don't see that happening.

The Greco-Roman project was focused on botanical remains and understanding the organization of the settlement: where and what was the industry, what neighborhoods can be discerned, what is the economic and social composition of the town. Karanis is an enormous site where you could just keep on excavating, but that is of course quite useless. Most of our questions will be answered through a forthcoming publication and several PhD theses. Apart from the archaeology, we were doing a lot of outreach and were involved in efforts to make the site and information about it available to the general public by restoring part of the old dig house of the University of Michigan as well as some of the ancient buildings that were in a very bad state. We also created an open-air museum to display a number of Pharaonic statues stored at the site. That type of work is extremely expensive and difficult to make sustainable. I thought as far as the research questions are concerned, we have really done what we want to do. For me, it was just time to move on to a new project.

Because I am now the holder of the Joan Silsbee Chair of African Cultural Archaeology, I could do something that has been a wish in the back of my mind for a long time: turning our attention south of Egypt. Egyptian archaeology has been very isolated, with its own chronology and terminology. If Egyptologists looked beyond the borders, that was always to explore direct relationships: with the Levant, with the eastern Mediterranean, with Sudan. Egypt in Africa; or Egypt in the Levant; or Egypt in contact with Mitanni, the Hittites, Kassites, Assyrians; or Egyptian trade with Crete. East Africa has seen very little attention, and we have always seen Egypt as something separate, usually the great colonizer. I think instead

it is really important to study tendencies that can be compared to aspects of Egyptian culture in different times, regions, and population groups.

**RM:** Besides the connections with Egypt, which other of your research interests will you carry over to your Ethiopian project?

**WW:** The community work that we started in Egypt will be a main factor of the work in Ethiopia as well. Secondly, in my work in Egypt, and also in other countries where I have worked, like Turkey and Yemen, I have an overarching interest in the role of ancient technology in society. Who are the producers? What is the social context in which they make things? How are those objects used? What is the social status of both the producers and users of those objects, basically the people that form most of society? In Egypt, there has been a lot of interest in the upper echelons, but much less so in settlement archaeology. The last few decades, however, a number of settlement archaeology projects have been started. This kind of research into settlement archaeology, ancient technology, and communities of practice in ancient society is something that has not been done sufficiently anywhere in the world, including Ethiopia.

There is another thing that is really hampering work in Egypt, and that is the fact that it is virtually impossible to take samples out of the country. With all the new techniques that we have to do analytical work—for instance, isotope or DNA studies—Egyptian archaeology is really held back. The good thing is that in Ethiopia we are allowed to take samples for research. That makes it much more viable to do the type of integral and deep research that we need to do.

**RM:** The other huge strength of working in Ethiopia is that we are really at the earlier stages of archaeological work in the region. We have the opportunity to start off perhaps on a different footing.

**WW:** Agreed. Ethiopian students are well-read and interested in being involved in community archaeology and ethnoarchaeology, which is something that is well established in Ethiopia.

**RM:** Ethiopia is also a great place to study baskets.

**WW:** Ethiopia is a great place to study basketry, and no one has done it. So my summer was very much focused on basketry. I studied the basketry in the Egyptian Museum in Turin and in southern Tunisia. In Turin the Cotsen Institute now has very important collaborations with the Egyptian Museum and the Polytechnic University, which provides great opportunities for students. We will also be working on an exhibit with a focus on ancient technology, which we will try to also show in Los Angeles.



**RM:** How do you feel about being a part of the Cotsen Institute and your new position as director?

**WW:** The Cotsen Institute is a unique collection of people: faculty, students, staff, a prominent institution—not just in the United States but worldwide. The cross-fertilization that happens in the Cotsen Institute is just awesome. Students not only get to work with great faculty but also get the chance to work with great faculty that are not necessarily working on their primary focus. The combination of Old World and New World archaeology, anthropological archaeology, and historical archaeology—the exchange of ideas and the questions that arise from that are all great. The theoretical backgrounds of different types of archaeology really help you to think about your own work. It really is a very stimulating and exciting environment.

**RM:** As director, I'm sure that to promote this thriving collaborative environment is one of the things that you want to do. I wonder if you could say something about what Chip Stanish has done as director, the things that you want to carry on into the future, and perhaps some of the changes you want to make.

**WW:** Chip's huge contribution is this collaboration between Old World and New World archaeology that I just mentioned. He has been very good at stimulating students to work outside their region. For instance, students who work primarily in Peru have come to work with me to Egypt, and some of my students, like you, have gone to work in Peru. Pizza Talks and the Friday seminars have a similar function. These create an opportunity of exchange within the institute, but with the world of archaeology in a broader sense. Chip has been amazing in fund-raising for the institute as well as for individual faculty members, as evident by the various endowed chairs. These endowed chairs are a huge help in creating further opportunities. He really put the institute on a much firmer financial footing. He also built on the existing group of Friends of Archaeology and greatly expanded the group of donors. I hope that I can step in his footsteps to continue that effort. Our donors are amazing. These are people who like the fun of archaeology and appreciate the importance of the research. Some of them would have liked to be archaeologists, and by being involved in the institute, they get to live their dream. We have some excellent archaeologists among our volunteers.

What I would build out is the function of the labs. I want to move away from the idea that the lab equals a person and instead focus on labs as collaborative spaces where faculty, staff, and students do



Figure 2. Willeke visits Lucy (AL 228-1) in her home in Addis Ababa, Ethiopia.

research that needs space and facilities. The first step in this direction is the Digital Archaeology Laboratory (DAL). Everything in archaeology is now digital, so this lab is essential. Labs function only if there is a person functioning as lab manager, such as Tom Wake, Deidre Whitmore—who has just been hired as lab manager for the DAL—and Alan Farahani, who is setting up the paleoethnobotany lab. That is the model that I want to expand upon. On my wish list is to have architecture and experimental archaeology labs. Achieving this goal also depends on which faculty members we have and how active they are in organizing and utilizing the labs. I would love to have a bioarchaeology lab, for instance, but only if we have a bioarchaeology faculty member to supply the staff to run it.

**RM:** Besides the labs, I know that you also want to make some changes in the public programs.

**WW:** Yes. Well, the problem of course is that it is very difficult for people to come to UCLA on a week-day night. Of course, traffic is horrible, and it takes you forever to get and park here. We are rethinking the programs. This has not crystallized out completely, but we were considering having fewer events and bigger events, with either big names or a lot going on. Sonali Gupta-Agarwal has enthusiastically started with atmospheric events, where the food, lecture, music, and different aspects all work together.

**RM:** Aside from the labs and events, do you have more new plans?

**WW:** There's the Publications Department, of course, which I have led as editorial director for three years. In that time, we have hired Randi Danforth, who is an amazing director of publications, and we are moving to partially digital publication. This is a step-by-step process in close collaboration with the library and existing repository initiatives such as Open Context and tDAR, because in archaeology raw data are extremely important. You can only excavate something once, so whatever we record, we need to preserve. The reason that we link the open access of data to publication is that data cleaning is a lot of work and often works best if you do it hand in hand with writing up and publishing your results. We are moving to a resource that builds on the UEE: an online text that links out to other sources of information. In the case of archaeology, one can access the data not only through the text but also instead start with images, a database, or an interactive map. Entry into the information can thus be many-sided. The text that you want as an online or printed book is the narrative or the interpretation, and everything else should be integrated and interactive online.

**RM:** I agree that this will be especially great for archaeological publications, because we always have thousands of photos, maps, drawings, etc.

**WW:** Exactly, and we are building it in close cooperation with initiatives that specialize in linked open data, such as Open Context, or are specialized in long-term preservation, such as tDAR. We are thinking about what are the data and what is the basic format that our data have to have in order for them to be part of the linked open-data movement. This will enable studies on a much broader spectrum of data and opens up new research avenues.

**RM:** I do know you have other projects running. I wonder if you could say a few words about those.

**WW:** As part of the new research project in Turin, we are starting a joint program with the Polytechnic University in Turin. We will have two guest faculty

members and two guest graduate students coming to UCLA during the winter quarter of 2017. One goal of that project is to virtually re-create the landscape of Lower Nubia, which was covered by Lake Nasser after the closing of the Aswan High Dam in the 1960s, and then position everything we know archaeologically in that model. We will start with the temples, four of which were famously moved to New York, Madrid, Leiden, and Turin, and then add the ancient settlements and cemeteries. We will also place the modern settlements that had to be abandoned in the 1960s in the virtual landscape. The second is a field school in Ethiopia, where we will have MA students from Axum and Addis Ababa Universities participate. They will be paired with students from the IFR. Finally, in the next academic year I will be co-teaching an upper-division cluster course that is focused on cultural heritage and the representation of identity. This will be the first upper-division cluster and one of the few classes targeted primarily at transfer students.

**RM:** All of this sounds very exciting. Thank you so much for talking with me and congratulations again on your new position.





Figure 1. Sebastian looks for symbols carved into a stone circle in Ireland.

## Interview with Our Youngest Friend of Archaeology: Sebastian Bader

*Rachel Moy*

REGULAR ATTENDEES AT Cotsen Institute events might have wondered about a young man who is a frequent visitor, usually stylishly sporting a fedora and often asking informed questions. *Backdirt* assistant editor Rachel Moy investigated and had the following conversation with seventh-grader Sebastian Bader and his mother, Dulcy.

**Rachel Moy:** I was very happy to meet you at the Friends of Archaeology dinner. It is nice to talk to you again. I'm curious about how you first became interested in archaeology?

**Sebastian Bader:** I became interested in archaeology when I was very little. My mom really loved archaeology, and she showed me a bunch of books on ancient Egypt. So, I started loving it too. When I was small, I liked canopic jars, and I called them my friends: Hapy, Duamutef, Imsety, and Quebehsenuf.

**Dulcy Rogers Bader:** When Sebastian was three, he would sit in his bed in the early morning, while we were still asleep, and look at the pictures in his books over and over again and memorize them. Right around that time, the Bowers Museum had an exhibition of Egyptian objects from the British Museum. So we took the kids. We got there, and the girls selling tickets were a little snooty and did not want the kids to go in. I told the girls, "They're very respectful and they won't touch anything. They're very good kids." They didn't believe me. While we were standing there, Sebastian saw the canopic jars down the hall. He turned and took off running, which wasn't like him, exclaiming, "My friends! My friends!" He then started naming them. Just then, the curator happened to be walking by and started talking to Sebastian. She was so impressed that she took us through the whole

museum, quizzing Sebastian on different pieces. He knew a lot, but she also told him things he did not yet know. That was sort of the beginning of this deep interest of his.

**SB:** I wish I could remember that. At the Science Center a few years ago, there was a mummy exhibit. I was really terrified, traumatized.

**RM:** It sounds like you are really interested in all things ancient, but it seems that you have some special interest in Egypt. Have you ever been there?

**SB:** No. I really want to go, but I think it is not the safest place right now.

**RM:** Yeah, hopefully it will stabilize in the coming years. Okay, next question: What part of the world or time period fascinates you the most and why?

**SB:** Definitely the Bronze Age and the Near East. I love the ancient Near East, especially Sumer, Egypt, and Indus. I guess I just really love ancient things, so that is why I love the Bronze Age. Egypt, because I grew up on it. I also really like ancient writing. I think that I have narrowed it down, and that is what fascinates me the most. The Harappans, I only discovered this year in January, but I instantly fell in love. Last, I just love all of the history of the Mesopotamians.

**RM:** Your areas of interest make sense, as writing started in these places.

**SB:** I have this really great book called *The Ancient Near East*. It has got an awesome table that has the evolution of cuneiform. It's so cool.

**DRB:** Writing has definitely become a focus of his within the last year. He is really fascinated by it, and he wants to crack the Harappan language.

**RM:** We definitely need someone to do that. I hope it can be you, Sebastian. Next question: In what ways do your parents encourage your interest in archaeology and the ancient world?

**SB:** Whenever I wanted a book about archaeology or history, they have always gotten it for me. They take me to museums and brought me to that great lecture series that Alan Farahani put on.

**DRB:** That lecture series, *Great Discoveries in Archaeology*—that was really a godsend. It was transformative for you, wasn't it?

**SB:** Yes. I am still sad that I missed the lecture on Greece.

**RM:** Do you think you'll do more with archaeology someday? Maybe go on a dig?

**SB:** Oh yes. I really want to go on a dig.

**RM:** In one of those areas you mentioned before?

**SB:** Yes, though my favorite parts of the world are also some of the most dangerous. Luckily, the Taliban do not care about the Harappans. They only dislike

the Gandhara. That is still awful, but fortunately the Harappans are safe.

**RM:** It seems that a lot of Sebastian's enthusiasm stems from you, Dulcy. I am curious where your interest comes from.

**DRB:** I'm not really sure, because my family was very theatrical and not really in science. I started when I was young, like Sebastian. I loved Egypt. I pursued it as much as I could on my own. My parents did not encourage it as much. I am a writer and actress by trade. I think telling stories is the most interesting part of humanity. With everything historical, learning the behind-the-scenes, the stories behind the event, that's the most interesting for me. I just find that fascinating. The person who really pushed me over the edge was Mary Miller. She was my professor for a Mayan course. She was so dynamic and inspiring. I had to write a final paper for her class. I found this piece of art that did not have much written on it. It is a sculpture of a man balancing on his stomach on a pole.

**SB:** They have one at LACMA.

**DRB:** It is a disk with six to eight figures on the bottom, and there is a pole in the middle with a man lying on his pelvis balancing on top. Mary put pictures of one up in class. She said there are only five of them in the world, and we do not know much about them. I thought that I could write about this, because there is less information and I can make my own interpretations. For me, because I'm a storyteller, I started to understand how theories get pieced together. I found all these other things that reminded me of the statue of the balancing man and stitched them together for this paper. I was taking the class pass or fail, because of my heavy course load. I finished the paper but was not too confident and was thinking that I have to get at least a C on this. Mary told me I had to come see her after class, and then she said to me that we should think about publishing the paper. I was surprised and nervous. I said to her that a lot of it was conjecture. She explained to me that conjecture is part of research. It's about piecing together the story. This is what I also love about Sebastian's attraction to the language. You are giving voice to people who have long been gone. Even though death is part of life, when you lose a parent or grandparent, a voice is stopped. Part of my own personal struggle is considering the meaning of that voice once it is silenced. Where does that voice go? It was there, and it was important in its own way. When a whole culture disappears, where is that voice? Where is that story? I was thinking about what Alan Farahani said about being unable to get to places or sites for political reasons. I was thinking that there



are all these voices trapped inside. It is very exciting when Sebastian is trying to decipher these symbols and cross-references. What were you talking about? Exploring the trade route?

**SB:** Yes. I remember that in Sargon's time, he mentioned trade routes with the great Meluhha. Everyone suspects that to be the Harappan civilization. Indus-style writing was found on a cuneiform tablet in Mesopotamia. I think that the Elamites are the key, because they are right in between. Because of the trade route going through there, I think that would be the place to find a bilingual text.

**RM:** We have not found a bilingual text yet, but that seems like a good place to look. Last question: How do you like the events at the Cotsen Institute so far?

**SB:** They are really cool. It is great to meet famous archaeologists on the West Coast and talk with them. It has been really great, because everyone is so accepting, even though I'm so young.

**RM:** You seem to know a lot for your age.

**DRB:** He is loving it. He comes home and reads more about whatever was talked about. Then we get more books or go see things in museums. The lecture series was just so inspiring, because it makes you think about so many things, not just archaeology, but also geopolitics, history, linguistics. It was beautifully put together. We also love the dinners. We were heartbroken when poor Professor Wendrich was dealing with projector problems. It was interesting regardless, and she is so lovely. She let Sebastian come talk to her in her office. It was amazing for him and has inspired a lot of family trips. When he graduated from elementary school, we said, "Where do you want to go?" He said, "Sicily, to see ancient stuff." This year my daughter wanted to go to Ireland, where we visited all these ancient stone ruins.

**SB:** The preservation there is great. Everything is made of slate.

**DRB:** We were shocked by these extraordinary dolmen and beehive huts. What amused us most is that the sites were completely accessible to anyone, any guy off the street. We actually asked Dr. Stephen Mandel about it. He sent us to a site that was on a farmer's land. It was a portal tomb, and Sebastian crawled right into it. These are just stacked stones. It's kind of genius. Like the oratory. I was amazed that there was a window among these stacked stones.

**SB:** And there was Knockroe. That was the ancient one, where we got lost. Mom got chased by farm dogs. We were about to open the gate, and two enormous dogs leapt over a man-sized gate.



Figure 2. Sebastian and his family in front of the Temple of Concordia in Sicily.

**DRB:** Then they started chasing us. That was pretty scary.

**SB:** We got lost on the way there.

**DRB:** We get lost a lot, but I refuse to give up looking.

**SB:** After asking a few people for directions, we came up to this old man with a staff and two farm dogs. Before we opened our mouths to ask, he just pointed.

**DRB:** It turned out, it was on his land that the remains of some tombs had relatively recently been discovered.

**SB:** Passage tombs.

**DRB:** The passage tombs that are all over Ireland sort of look like a lollipop. One of them was in fabulous shape. You could still see the carvings. I was talking to the farmer about what he thought about the tomb. He just said that he grew up on this land and so had his father. When his father was angry at him, he would send him here as punishment. I found that to be really interesting.

**SB:** The Dublin Museum was cool too and really well organized.

**RM:** Besides going on an excavation, what do you think your future in archaeology will be?

**SB:** I would probably be somewhere in a shack looking at Indus seals. I really want to study writing in the future.

**RM:** That would be amazing. I hope you stay involved with archaeology. Thank you both so much for talking with me and for supporting research at the Cotsen Institute.

## Interview with Our New Director of Public Programs: Sonali Gupta-Agarwal

*Rachel Moy*

SONALI GUPTA-AGARWAL WAS awarded her PhD in archaeology from UCLA in 2015 with a dissertation entitled “Understanding Transmission of Skill as Influencing Continuity or Change through Locally Manufactured Utilitarian Ware at Greco-Roman Karanis.” Since her graduation, she has remained closely affiliated with UCLA. In 2015–2016, she was awarded the Dean’s Lectureship in Social Research, teaching a course focused on using archaeology and ethnoarchaeology to understand modern social issues. Following that she was appointed director of public programs at the Cotsen Institute.

**Rachel Moy:** First of all, I want to say congratulations on your new position as director of public programs for the Cotsen Institute. I want to talk about your new role, but first I want to start at the very beginning. How did you become interested in archaeology?

**Sonali Gupta-Agarwal:** Archaeology was always my interest, but in India, archaeology was not considered a very good profession. There is a lot of pressure to do something like engineering, or being a doctor or a lawyer. My father always told me, “Do archaeology, but make yourself professionally secure.” I decided to do law, but during this time I always felt that archaeology was my true passion. So during my holidays, I started to go to this archaeological society and ended up doing arbitration for them. I would also go to their library. I did not like the way things were cataloged, so I offered to help them out. I reorganized the library and won the case for them. They then invited me to go on an excavation, and I got very excited. We went to a Roman trading port on the western coast of India that is mentioned in the first-century-A.D. *Periplus of the Erythraean Sea*. In the excavation, they were trying to

corroborate literary references to places that existed in the early historic period. We surveyed the area, and that was my first foray with pottery. I really liked the idea of splitting things up and organizing them. I studied the pottery in terms of function and dating and wrote an article about it. After that, I moved to the United States and got married. While pursuing a law career in California, Roberta Tomber of the British Museum contacted me. She is an authority on Egyptian and Indian pottery. She had read my article and told me that as I was in the U.S., I should meet Willeke Wendrich. I thought that I would keep doing archaeology as a hobby and would help Willeke with the database for Karanis, in Egypt. At some point she asked if I would like to come to Egypt, and I said of course. When I returned, I studied to take the bar, but my heart was sinking. Archaeology was calling out to me in a very loud way. I called up the Cotsen graduate student officer and asked what the procedure is to apply. She said that I would need to take the GRE and TOEFL exams, write a statement of purpose, and obtain three recommendations. This was on the third of December 2006, and the deadline was the eleventh of December. Miraculously, I got my application together in time and was accepted into the program. The last line of my statement of purpose was the quote of Paulo Coelho that if you really want something with your whole heart, the whole universe conspires to get it for you. That’s how I got into archaeology, and I could not have been happier.

**RM:** You already answered my second question, which is why did you start working in Egypt? But perhaps you could expand on your answer and talk more about your experience working for many seasons on the Fayum project.





Figure 1. Sonali Gupta-Agarwal studies Greco-Roman pottery in a tent in the Egyptian desert.

**SGA:** Why I selected Egypt was partly because in the 1960s, my father had visited Egypt, and he would tell me stories of the pyramids. Growing up, he would talk to me about the Romans and would take me to museums. I was not very interested in Pharaonic Egypt but always in the Greco-Roman period. That is why Karanis felt right. Karanis itself is a beautiful site, and I loved working on the pottery there. I also loved the kind of independence that Willeke gives her students. She just throws you into it, and after a while you feel how you will pull it off, how you will learn. She wants you to start from scratch and find your own ways, your own methodology. Slowly and steadily, I started to feel almost more Egyptian than anything else. Especially working with Mohammed, my pottery assistant, felt like home. Living at Karanis, you learn a lot of things that you would not learn otherwise. It makes you appreciate people and understand the meaning of being human. Archaeology is such a wonderful field.

**RM:** Branching off from that, could you talk a little about your dissertation research?

**SGA:** My dissertation was on cultural transmission. Specifically, I wanted to know how learning is transferred from generation to generation. The topic of learning was of personal interest to me, because

growing up I lived in different countries. My father was a diplomat. It was a challenge to adapt each time we moved. In India, the training you get is not to question the information you are given. You just have to take it to be the truth. Critical thinking is not something that is encouraged. So the first core course in America was very difficult for me, and I had to unlearn much of what I had learned in India. My Indian education and my law education made me write in a flowery way. I had to learn to be straightforward in my writing. It was difficult to take the Victorian English out of my writing. I also had to develop the skills of critical thinking, to question authors who I thought were stalwarts in their field. Slowly and steadily, I learned these new skills. This really changed the way I perceived things and the way I learned. That learning experience was very important for me, and I wanted to do something related to it. Also, I'm a people person. Archaeology is mute, because the people are no longer alive. I wanted to develop a way to use something I see in the present to learn about the past. So I started going to pottery workshops. One day I started writing a paper called "Learning from Learning." I then realized that I wanted to focus on how skill is transferred and how we interact with one another. I never really spent time in the kitchen,

but after I came to America, I discovered that I know most of my mother's recipes from just watching her. I started reflecting on things like enculturation and habitus. I thought, "All these theoretical things—I've experienced them, so now let's take it to the next level," and that is what I did for my dissertation.

**RM:** I would now like to talk about your new position. I hear that you have lots of big plans, and I would love to hear about them.

**SGA:** I do have big plans. The good thing about big plans is that Willeke is open to change. We brainstormed after I was accepted. She wanted me to do something about the public programs. I told her that the way they are conducted now is the way they've been done for a long time. People come for the lecture, they listen to the lecture, and that's it. I told her there's not enough emotion, there's nothing of the culture of the place. We have donors coming who love archaeology, but the archaeology they're open to is something very different from what we do, which is painstaking work. If we show the details of that work, they may appreciate the hard work, but it won't get them excited about it. How to communicate that excitement? For example, for the Ethiopian lecture, people come, they have appetizers, they sit and have dinner, they listen to the lecture, and then a few people ask questions. I suggest we do it in another way, with Ethiopian music, Ethiopian cuisine, artifacts from Ethiopia displayed, and people who work in Ethiopia will come to the panel at the end and have a discussion. In this way, students and faculty members can address questions together. In October, for the Cotsen Prize, the theme is going to be Peruvian. I've organized for Peruvian cuisine to be served, so that the attendees can get a taste of that region. We're going to have Peruvian music, so that we can usher them into the world of Peru. The person getting the prize has done a lot of research in Peru. So that will set the stage for the lecture that she will give.

We are also trying to change the way that we do the open house. I remember teaching students at UCLA that came from other disciplines. If you ask them about archaeology, many think it has to do with dinosaurs. We must be held responsible for not disseminating information the right way. How to change that perception? How can we explain to the public that archaeology is not just Indiana Jones or Lara Croft? These are the kinds of issues that we want to address, starting in Los Angeles. We have also talked about the website. It is now better than it was, but we want to add more things, such as short films showing the work that we do and more interactive pages. This

way people may get excited and give to the institute. We can have the students listed on the pages of the faculty. That way people will know which students have which advisor and what their topics are. We should also have an alumni page where people can network and which will enhance the public image of the institute.

**RM:** Can you talk more specifically about how the open house will change?

**SGA:** Recently there has been a decline in the number of people coming to the open house. Especially, there have been fewer children. We want to do it in a different way to attract more and new people. We were thinking of combining it with other events on campus, such as Bruin Day. Many students are then at a stage where they are deciding what to do about their career. An open house will allow them to understand what archaeology is about, that it is a serious subject, that it is interdisciplinary, and that ours is an interdisciplinary institute. Even though we do not have an undergraduate program, if we open avenues for UCLA students, more young people will become excited about archaeology. We can add music, have some sort of theme, have a lecture, and have the faculty present. We're still at the beginning stages of deciding what to do. I have also suggested that we have an archaeology literary festival. We have our own publications. We could invite selected authors, and books of the institute can be sold. We want to make archaeology more exciting, more approachable, more interesting. We are also thinking of making exhibitions in the institute. An exhibition of photographs taken by students, for example, and maybe have visitors buy the photographs. I know archaeologists have an eye for things. The way we photograph often expresses a moment, and because we know places, we are so much more connected. Those are some of my big plans.

**RM:** These are exciting plans with lots of changes!

**SGA:** Most importantly, my dissertation was on continuity and change seen through archaeological artifacts, through transference of skills and how the transference of skills actually regulates change and continuity. The Cotsen Institute is also an example of that. Change has to happen. Some traditions have to continue, but change is equally necessary. If changes occur in an environment with lots of interaction and positive energy, they can bring great opportunities and exciting times. I think there will be lots of change during Willeke's directorship. She is involved in the digital realm, and she wants to go in that direction. I think we're living in a world where we have to do things like that. These are exciting times.





Figure 2. Sonali helps load a car after a long day of fieldwork.

**RM:** Though we are going to be making all these changes, we of course, as archaeologists, still owe a lot to the past. In taking on this role, you're filling some very big shoes. If you could, talk about what Helle has done that you will continue and the kind of things you have learned from her.

**SGA:** Helle has always been like a mother figure for me and the institute as a whole. With any question, you could go to her and she had the answer. I started training for this position with her, and she started telling me things to do and not to do. She had everything written down and organized, which is a big help. Everyone really respects her. To take on the position from her, I have to learn these things. I need to learn from what she has done, but I'm also bringing in changes that are inspired by the traditions that she has established. For example, she understands people, because she has worked with them for so long. That is a big asset that comes from experience. Being with her and asking her about people is very valuable for me. I sat with her, and we would go through lists of people, and she would say things like, "This person doesn't like to RSVP, so you have to call them." Things like that I would never think about, but now that she told me, I can keep her advice in mind. She helped me to be diplomatic and sensitive to people's temperament. Interaction and understanding people is likely the most important thing I have learned from her.

**RM:** Those were the questions that I had, but feel free to add anything else.

**SGA:** I want to add that I want to make a difference in the way things are in education and in outreach. I love teaching. The year before this, when I was doing the Dean's Lectureship, I had a wonderful time teaching students about the relevance of archaeology in studying contemporary social issues. When you talk to people, they may say, "What's the point of archaeology? It's fun, but why are you so interested in the past? It's long gone." To understand the past is so relevant, and one of the steps to be taken is public outreach. If we succeed, it will have a domino effect on other aspects of archaeological education. If we have donors, we are able to fund more students passionate about archaeology. In this way, we can create a new battalion of students to spread the word. It is more important today than ever before, especially with what ISIS has been doing and how heritage is getting lost. We need that awareness. I feel that if we are all rooted in our past, by archaeology and an understanding of cultures, it can really make a difference in our lives. If we do it the right way, we can make a difference in how archaeology is perceived.

**RM:** I absolutely agree, and I must say your passion is contagious. I wish you much luck with your inspiring plans and your new position.

## DIG Initiative: Sustainable Archaeological Data Publications

*Willeke Wendrich and Deidre Whitmore*

ACADEMIC PUBLISHING is integral to scholarly communication within and across the disciplines active in archaeological research. The dissemination of research data is especially significant within archaeology, a research community that deals with often-irreplaceable data sets and continuing threats to records and sources. For decades, the Cotsen Institute of Archaeology Press (CioA Press) has been instrumental in the publication of archaeological field reports, frequently with the associated data printed in lengthy appendices. The large, expensive nature of these volumes prevents most publishers from accepting the manuscripts, despite the fact that they present information that should be publicly available. While technological innovations have expanded the volume and speed at which digital data are collected and analyzed, advances in the dissemination of data have lagged behind. Rather than sharing data in lengthy appendices or printed tables, the CioA Press has recognized the need to share data in reusable formats. The DIG Initiative addresses this need by establishing an online data-publishing platform

in which data sets are integrated into archaeological publications (Figure 1).

The DIG Initiative encompasses not only building the infrastructure for this data platform but also establishing work flows to support submitting, reviewing, and preserving digital components in a sustainable manner. The integrated data records will be identified and described according to Linked Open Data (LOD) standards, the current best practice for sharing data online.<sup>1</sup> By utilizing LOD methods and standards in the organization and description of archaeological data, records can be cross-referenced and accessed through various means. In accordance with scholarly practices, the citation of data will be facilitated through visible and easily exportable recommended citations associated with records and data sets.

### ARCHAEOLOGICAL DATA-PUBLISHING COMMUNITY

Several data-preservation and data-sharing services specializing in archaeological data have grown out of an increasing interest within the research community. These services have been

gaining attention through promotional events focused on the use of their data collections. In 2014 the Archaeology Data Service (ADS) began rewarding the reuse of archaeological data sets within its collections through the Digital Data Re-use Award. The Digital Archaeological Record (tDAR) offered participants at the Twenty-Ninth Annual Meeting of the Society for American Archaeology the chance to deposit papers, posters, or up to three files/30 megabytes of supplementary data within the repository free of charge.<sup>2</sup> In 2016 the data-publishing service Open Context and Carleton University started the Archaeological Visualization Prize for visualizations utilizing data from Open Context.<sup>3</sup> Open Context has led the exploration of both a peer-review process for archaeological data and the implementation of LOD standards.

While these events demonstrate a wider acceptance of and interest in sharing and reusing data within archaeology, current services maintain a separation between printed books, which are the foundation of archaeological research, and the data they curate. The



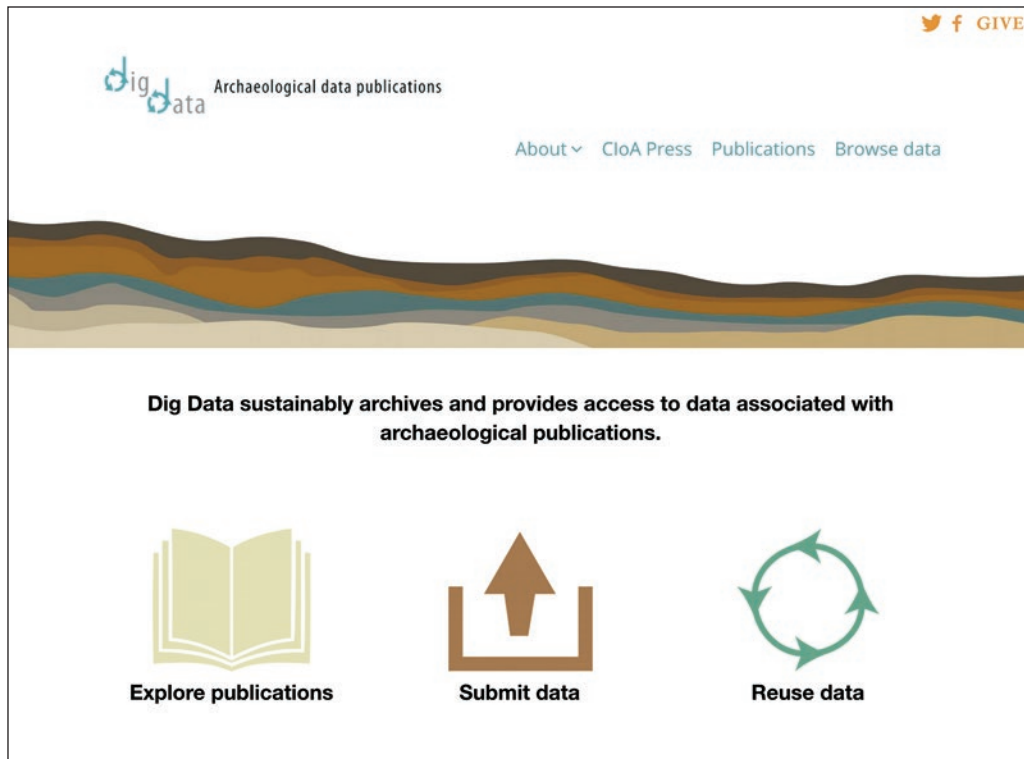


Figure 1. A screenshot of the DIG Initiative interface.

DIG Initiative addresses this gap by establishing a platform on which data sets are integrated into texts that can be read, searched, and downloaded by users. The integrated data can be studied as part of the written argument or downloaded and used for comparative research purposes.

Collaboration with existing data services like Open Context and tDAR is essential to the sustainability of the DIG platform. Our team will continue to work with Open Context to employ LOD methods to join and strengthen platforms and services and to develop data peer-review processes. Additionally, the directors of Open Context, tDAR, and ADS have agreed

to collaborate on the next phase of the DIG Initiative. Maintaining interoperability and ongoing collaborations with these services will also help us identify, track, and adapt to changes within the archaeological research community.

#### PHASE I: START-UP (2014–2016)

To ensure that data published by the CIOA Press will be available regardless of technological changes, our team secured an agreement with the UCLA Digital Library (DL) to deposit data in the institutional repository. In 2014 members of the DIG Data team worked with DL programmers Martin Klein and Kevin Clarke in the evaluation of a new repository framework that supports LOD standards. The next step involved a series of interviews with directors and data managers from archaeological projects to identify a range of data types, such as geospatial coordinates, photographs, and field notes. Based on these investigations, a template online database was constructed in the open-source content-management system Drupal, the primary system supported by the

DL and the institutional repository.<sup>4</sup> This database serves as the structural foundation of the DIG platform, allowing subsites within the platform to share the same architecture while the visual presentation is adapted to correlate with the design of the associated publication (Figure 2).

Within the Drupal database, template records for each identified data type were established, with applicable metadata fields and, when relevant, controlled vocabularies standardizing how information is entered into these fields. The metadata fields are based on three sources: the Guides to Good Practices from ADS; the fields employed in the ADS, tDAR, and Open Context systems; and needs identified by archaeologists during the data interviews.<sup>5</sup> The controlled vocabularies are taken from either archaeological publications and existing metadata or from sources such as

1. "Data—W3C," <https://www.w3.org/standards/semanticweb/data/>, accessed August 1, 2016.  
 2. "SAA 2015 | The Digital Archaeological Record," <http://www.tdar.org/saa2015/>, accessed August 1, 2016.  
 3. Katie Green, "Digital Data Re-Use Award | Sound Bytes from the ADS," <http://archaeologydataservice.ac.uk/blog/2014/10/digital-data-re-use-award/>, accessed August 1, 2016; "Open Context and Carleton Prize for Archaeological Visualization | Heritage Bytes," <http://ux.opencontext.org/2016/06/20/open-context-carleton-prize-for-archaeological-visualization/>, accessed August 1, 2016.

4. "Drupal—Open Source CMS | Drupal.org," <https://www.drupal.org/>, accessed August 1, 2016.

5. "Guides to Good Practice: Contents," <http://guides.archaeologydataservice.ac.uk/g2gp/Contents/>, accessed February 14, 2016.

## DIG Initiative *(continued)*

the Getty Thesaurus of Geographic Names (TGN) and PeriodO.<sup>6</sup> Initiatives like PeriodO formalize scholarly defined vocabularies and classifications while also allowing for the flexibility of differences that may occur among sources of definitions. Going forward, we plan to collaborate on and utilize similar initiatives to formally publish data and classification schemes.

The template database constructed during the start-up phase was designed to be adapted to the needs of each data set. The diversity of recording practices, methods, and processing techniques in archaeological research produces a significant variety of data models and metadata fields utilized by projects. While each of these models could be fully reproduced, it would be challenging to search for data across different projects or publications, and users would be unable to reorder or regroup data on demand. To capture this diversity while maintaining the ability to search and more easily use

data across publications, an extensible framework was developed. In this framework, the entire collection of data types is broken into broad categories, such as textual, visual, and spatial data. Each data type has the same set of core metadata fields, regardless of category. However, additional fields that provide more granular, specialized information are incorporated into each data type template. For example, while textual, visual, and spatial data records all have fields designating temporal periods and cultural associations, the spatial data types also have fields in which coordinates and surveying equipment can be entered.

Our team developed a work flow for ingesting, reviewing, and processing data submissions that focused on capturing and preserving high-quality metadata and documentation. Initially, our team consults with authors to map any existing information surrounding their data to the established metadata fields (Figure 3). To

facilitate this process and extend the amount of metadata gathered, tools to harvest metadata from the submitted manuscripts were developed and are currently being tested and enhanced. These processing scripts were written in the coding language Python by David Khachatryan, a work-study student at the Scholarly Innovation Lab in the Young Research Library, and are openly shared on GitHub.<sup>7</sup> These tools utilize terms available from open vocabularies such as PeriodO to create a digital index of terms in a manuscript, captions, and supplementary materials. Once this data mining is completed and the template database has been adapted to meet the needs of

6. "Getty Thesaurus of Geographic Names (Getty Research Institute)," <https://www.getty.edu/research/tools/vocabularies/tgn/>, accessed June 10, 2015; "PeriodO—Periods, Organized," <http://periodo.do/>, accessed June 10, 2015.
7. "NLTA Metadata Creator," <https://github.com/dkhachatryan/NLTK-Metadata>, accessed August 1, 2016.



Figure 2. A screenshot of the subsite associated with the publication *The Archaeology of Grotta Scaloria*.



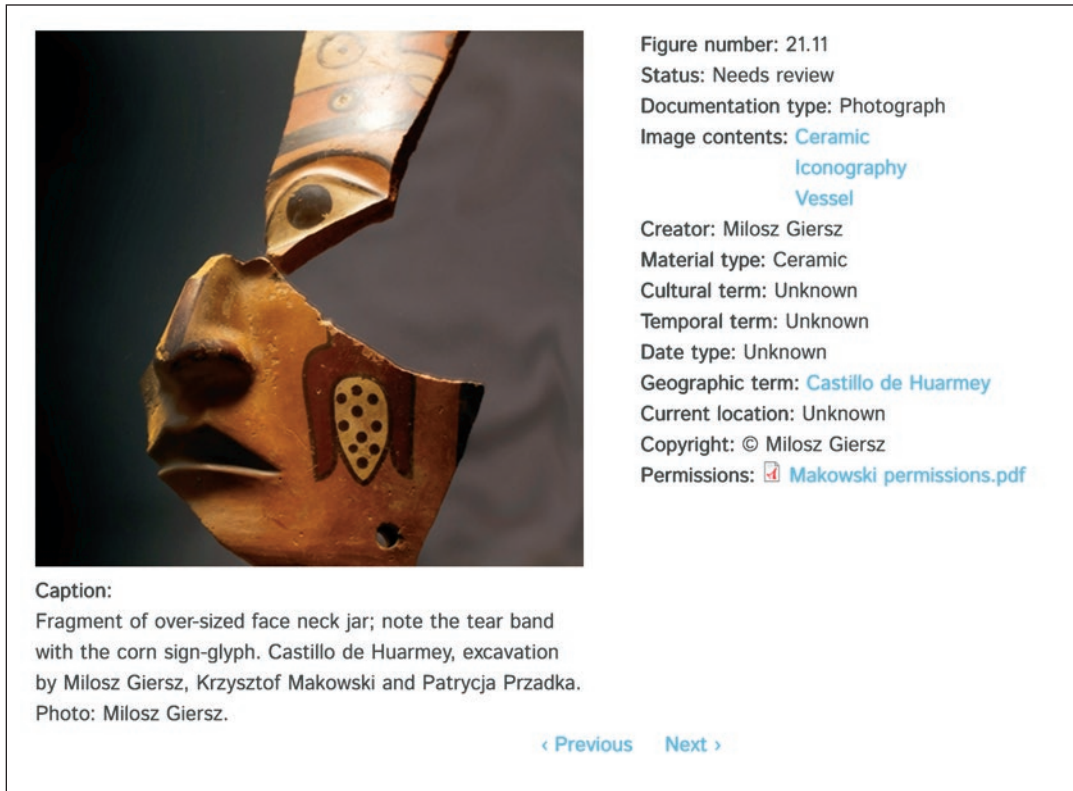


Figure 3. A data record in which an author has added descriptive metadata about a photograph of an artifact.

the publication, the data, any available metadata, and the output of these tools are uploaded to the database. To systematically gather and review the data records, the database is opened to the authors for review. The authors check the records and are given access to enter any missing metadata.

#### PHASE II: NEXT STEPS

The next stage of the DIG Initiative extends the functionality of the data platform to integrate data records into electronic editions of publications, so that research data are disseminated within their scholarly contexts. Integrating archaeological data sets with written publications allows researchers to share the basis of their interpretations as a part of scholarly debate. Descriptions of the methodologies employed to collect, process, and analyze data sets are shared within these publications. Establishing a means to share data in conjunction with the publication enables researchers to better evaluate interpretations and scholarly work while supporting their ability to reinterpret and reuse data.

During Phase II, procedures for a data peer-review process will be developed and incorporated into the current peer-review process at the CIOA Press. This process will be extended to examine not only data but also the integration of the data with the publication. Additionally, a training course in which reviewers will be guided to a consistent and transparent review procedure will be established.

In the next stages, our team will continue to collaborate with DL to develop an institutional repository and to establish ingest procedures from the DIG infrastructure into this repository. As our team is developing the DIG platform interface, user feedback is essential to inform design and functionality. Comparative research, user behavior, and informal user-experience studies provided the basis for the architecture of the platform in its present form, but focused usability studies targeting the search, navigation, and interface layouts will provide more qualitative feedback on the public interface. For CIOA faculty and students, assistance will be available

in the Digital Archaeology Laboratory in the form of high-end computers with the software necessary to prepare digital publications. The DIG team will give workshops on the principles and practicalities of data collection and publication. Deidre Whitmore, the Digital Archaeology Laboratory and data publication manager, is available for one-on-one consultations. This resource is of utmost importance, especially for graduate students, because a healthy start of your data life enables data longevity as the foundation of lifelong professional benefits.

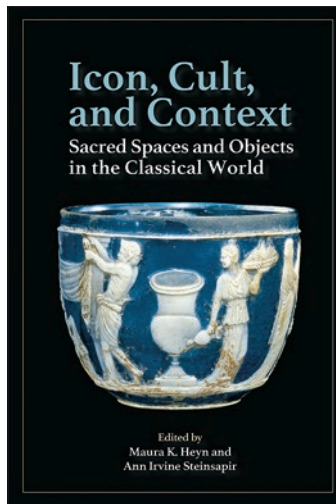
## FROM THE PUBLISHER'S DESK

SEVERAL OF OUR BOOKS this year have strong UCLA connections: a Festschrift for an influential emerita professor in art history, with contributions from several UCLA faculty members who were her students; the publication of a site report from a longtime project in Italy by one of our Cotsen associates; and an intriguing volume on parallels between imperial Rome and the New World enacted by the confrontation between Spaniards and Aztecs, coedited by a Getty curator and a UCLA adjunct art history professor. Later this year we will publish a book about art and authenticity, and how this is impacted by restoration and forgery, from one of our Cotsen–Getty Conservation faculty members. Rounding out our year is a book about pastoralist cultures of the Bronze Age in the Russian steppes. We continue to expand our digital and electronic publishing, with the exciting development of an online archiving site for searchable databases and research associated with our print publications. This takes the Cotsen Institute of Archaeology Press into the vanguard of scholarly digital publishing, which will be facilitated for authors in our new Digital Archaeology Laboratory.

— *Randi Danforth*

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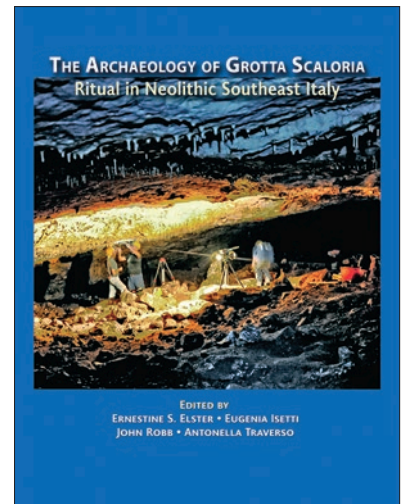
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### Icon, Cult, and Context Sacred Spaces and Objects in the Classical World : Essays in Honor of Susan B. Downey

*Edited by Maura K. Heyn  
and Ann Irvine Steinsapir*

This Festschrift honors UCLA professor emerita Susan Downey's meticulous scholarship on the architecture of classical world sacred spaces and the objects and imagery contained in those spaces. The contributors, former students and current colleagues of Downey's, demonstrate a shared concern for very careful consideration of the evidence in their analyses of religious iconography, cult practices, and sacred edifices. The book is divided into sections that echo the title of the volume: icon, cult, and context. The iconography of gods and goddesses, analysis of sacred imagery in the context of ancient cult practices, and the design and decoration of sacred spaces are the main themes of the book. Downey's influence shines through in these discussions of cult objects, iconography, and religious architecture, which echo her mentorship of several generations of art history and archaeology students and recognize her scholarly achievements.



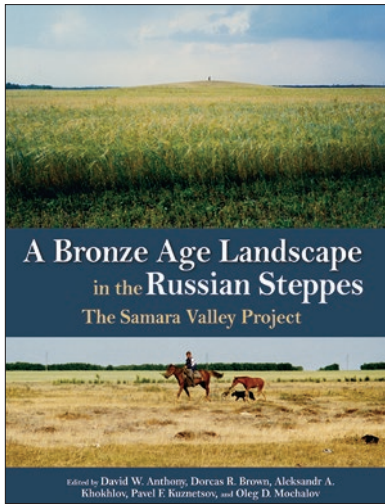
### The Archaeology of Grotta Scaloria

Ritual in Neolithic Southeast Italy

*Edited by Ernestine S. Elster, Eugenia Isetti,  
John Robb, and Antonella Traverso*

Scaloria Cave, or Grotta Scaloria, is in Apulia, where the Tavoliere Plain rises to meet the Gargano Peninsula. Hundreds of villages were located there during the Neolithic period. These *villagi trincerati* were first identified in aerial photographs taken by the British RAF during World War II. Certainly, some of the Neolithic villagers of the Tavoliere visited Scaloria Cave, for refuge from the elements and for the mysterious rituals held in both the Lower and Upper Chambers. Grotta Scaloria was first discovered and explored in 1931. It was excavated briefly in 1967 and extensively from 1978 to 1980 by a joint UCLA–University of Genoa team but was never fully published. The Save Scaloria Project was organized to locate this legacy data and to enhance the information by application of the newest methods of archaeological and scientific analysis. Finally, this important site is published, in one comprehensive volume that gathers together archaeological data from the Upper and Lower Chambers of Scaloria Cave, which indicate intense ritual and quotidian use during the Neolithic (circa 5600–5300 B.C.). The Grotta Scaloria project is also important as historiography, since it illustrates a changing trajectory of research spanning three generations of European and American archaeology.



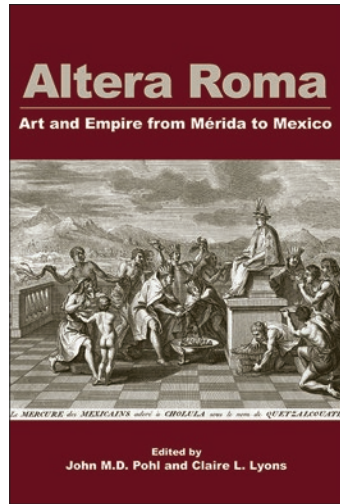


## A Bronze Age Landscape in the Russian Steppes

### The Samara Valley Project

*Edited by David W. Anthony, Dorcas R. Brown, Aleksandr A. Khokhlov, Pavel F. Kuznetsov, and Oleg D. Mochalov*

The first English-language monograph that describes seasonal and permanent Late Bronze Age settlements in the Russian steppes, this is the final report of the Samara Valley Project, a U.S.–Russian archaeological investigation conducted between 1995 and 2002. It explores the changing organization and subsistence resources of pastoral steppe economies from the Eneolithic (4500 B.C.) through the Late Bronze Age (1900–1200 B.C.) across a steppe and river valley landscape in the middle Volga region. Particular attention is paid to the role of agriculture during the unusual episode of sedentary, settled pastoralism that spread across the Eurasian steppes with the Srubnaya and Andronovo cultures (1900–1200 B.C.). The SVP archaeologists made three astonishing discoveries: agriculture played no role in the LBA diet across the region, a surprise given the settled residential pattern; a unique winter ritual involving dog and wolf sacrifices, possibly related to male initiation ceremonies, was practiced at Krasnosamarskoe; and overlapping spheres of obligation, cooperation, and affiliation operated at different scales to integrate groups defined by politics, economics, and ritual behaviors.

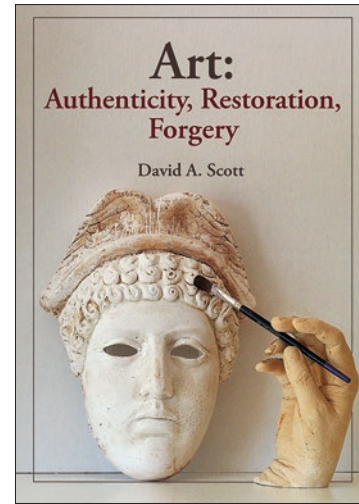


## Alterra Roma

### Art and Empire from Mérida to Mexico

*Edited by John M. D. Pohl and Claire L. Lyons*

*Alterra Roma* explores the confrontation of two cultures—European and Amerindian—and two empires—Spanish and Aztec. In an age of exploration and conquest, Spanish soldiers, missionaries, and merchants brought an array of cultural preconceptions. Their encounter with Aztec civilization coincided with Europe’s rediscovery of classical antiquity, and Tenochtitlán came to be regarded as “another Rome,” *alterra Roma*. Iberia’s past as the Roman province of Hispania served both to guide and critique the Spanish overseas mission. The dialogue that emerged between the Old World and the New World shaped a dual heritage into the unique culture of Nueva España. In this volume, 10 eminent historians and archaeologists examine analogies between empires widely separated in time and place and consider how monumental art and architecture created “theater states,” a strategy that links ancient Rome, Hapsburg Spain, prequest Mexico, and other imperial regimes.



## Art: Authenticity, Restoration, Forgery

*David A. Scott*

This book presents a detailed account of authenticity in the visual arts from the Paleolithic to the postmodern. The restoration of works of art can alter the perception of authenticity and may result in the creation of fakes and forgeries. These interactions set the stage for the subject of this book, which initially examines the conservation perspective and then continues with a detailed discussion of notions of authenticity and philosophical background. There is disputed territory between those who view the present-day cult of authenticity as fundamentally flawed and those who have analyzed its impact upon different cultural milieus. The book presents several case studies where the ideas of conceptual, aesthetic, and material authenticity can be discussed, looking at art from the ancient to the contemporary, illuminating concerns relating to restoration and art forgery.



Friends of Archaeology and donors of the Cotsen Institute visit the pyramid of Abusir during a guided tour to Egypt.



# Friends of Archaeology

## GET INVOLVED

Do you find yourself spending your vacations wandering among ruins and visiting archaeology museums across the globe? At the Cotsen Institute, there are a number of ways to get involved in archaeological research in Los Angeles and beyond.

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Join the Friends of Archaeology, the Cotsen Institute's support group dedicated to sponsoring graduate student education, faculty research, publications, and many other initiatives. There are three levels of membership—Basic Members (\$300–\$999/year), Director's Fellows (\$1,000–\$4,999/year), and Director's Council Members (\$5,000+/year)—with many benefits, including special guided trips to archaeological sites, domestic and international tours with faculty, and behind-the-scenes events at UCLA. *(See membership/renewal form on reverse side.)*

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Moche nose ornaments excavated and photographed by  
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