



# Sacramento Archeological Society, Inc. Newsletter

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[www.sacarcheology.org](http://www.sacarcheology.org).

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July/August - 2020

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SAS is continuing its mission to educate our members and supporters in ways possible despite the challenges of COVID-19. We will continue to email current archaeological news to SAS members and offer FREE webinars on various archeological topics. We will be providing Zoom contact information for the webinars to members. We encourage registration for non-members through [registration@sacarcheology.org](mailto:registration@sacarcheology.org).

## UPCOMING EVENTS

**July 18, 2020**, Saturday, 2:00 p.m. - **SAS Webinar** “Mound Builders of North America” by Lynette Blumhardt

**August 15, 2020**, Saturday, 2:00 p.m. - **SAS Webinar** “How to Make Sense of OSL without a degree in Physics” by Tom Johansen

**September 12, 2020**, Saturday, 2:00 p.m. - **SAS Webinar** “Lovelock Cave Excavation – Its Contribution to the Science of Archaeology” by John Foster

See calendar in [www.sacarcheology.org](http://www.sacarcheology.org) for complete set of events. Note that the **The Four Corners Tour** will be rescheduled to 2021.

### **The Archaeological Conservancy 2020 Fall Tours**

October 17-24 Peoples of the Lower Mississippi Valley

October 23 – November 2, 2020 – Oaxaca

For information on these tours refer to [www.archaeologicalconservancy.org](http://www.archaeologicalconservancy.org)

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## SCHOLARS ANNOUNCED

### *2020 Scholars*

Sacramento Archeological Society, Inc. is pleased to announce our 2020 scholarship recipients. Fewer applications were received this year probably due to COVID 19 but the scholars from University of California Davis were truly worthy.

Thanks to the SAS members who contributed funds we were able to financially support seven scholars. Unfortunately, two of these had to decline the scholarship because the UC Davis field school was recently cancelled. The field school in Belgium is also in jeopardy. It may be rescheduled for this fall. Presentations by the scholars will be scheduled in early 2021. A brief synopsis of the recipient’s archaeological projects follows:

**Caleb Chen**

Caleb is a senior at University of California, Davis. He will use the scholarship to attend a field school at Trou al'Wesse, Belgium. The goals of this year's excavation are to finalize the study of the Mousterian assemblage from the 2016-2018 excavations and continue excavating inside the cave to better understand the formation processes of the Aurignacian layer, and the nature of human occupation. Artifact analysis and paleoclimate reconstruction will be used to determine the identities of the occupants, their reasons for occupying the cave and human and Neanderthal settlement patterns in north-western Europe.

**Luis Flores-Blanco**

Luis is a PhD candidate at University of California, Davis. He is an accomplished field archaeologist in Peru with over 12 years of experience. He will use the scholarship to measure hydration depths among temporally diagnostic projectile points from Titicaca Basin, Peru. As part of his larger effort to understand emergent social complexity in the South-Central Andes, Luis proposes to develop an obsidian hydration curve for his study region. This is one of few parts of the world where hunter-gatherers gave rise to agricultural economies and state-organized societies such as Tiwanaku, Wari, and the Inca.

**Daniel Goring**

Daniel is a senior at University of California, Davis. He is proposing to study the Mousterian lithic assemblages from Trou al'Wesse, Belgium. The scholarship will offset expenses for the studies.

**Morgan Hall**

Morgan is a sophomore at University of California, Davis. She planned to use the scholarship to attend U. C. Davis Field School – Humboldt-Toiyabe National Forest at the site of Tunna'Nosi'Kaiva' Gwaa, near the California and Nevada border. The goal of this research is to study cooperative hunting events through examination of large scale trap complexes and rock rings using pedestrian surveys, excavation, and laboratory analysis to answer the question "Why humans participate in cooperative hunting activities". This would have been Morgan's first field school experience. Unfortunately, the field school was cancelled.

**Nikoletta Karpanos**

Danielle is a senior at University of California, Davis. She planned to use the scholarship to attend U. C. Davis Field School – Humboldt-Toiyabe National Forest at the site of Tunna'Nosi'Kaiva' Gwaa, near the California and Nevada border. The goal of this field work was to gather information regarding the evolution of cooperative hunting in the Great Basin over the past 5000 years. Participating in this field school is a necessary and valuable experience for her future endeavors as a graduate student and a CRM archaeologist. Unfortunately the field school was cancelled.

**Jessica Morales**

Jessica is a PhD student at University of California, Davis. Her research focuses on the possible use of dogs as "hunting tools" in California. To commence in this project, she will need to differentiate dog remains from other canid remains. While useful, traditional zooarchaeological

methods are at times not enough to distinguish domestic from wild dogs or hybrids. Her project proposes to distinguish domestic from wild canid through a combination of traditional zooarchaeological methods, morphometrics, geometric morphometrics, and stable isotopes of bone and teeth of Alta and Baja California canids. Drawing from the Canine Surrogacy Approach, diets of domestic dogs are expected to yield evidence of human provisioning, compared to those in the wild. For this project it is critical to visit and analyze collections in facilities where microscopes may not be available. A handheld digit a microscope will allow her to analyze, photograph and measure bone trauma of canid bones.

### **Peiqi Zhang**

Peiqi is a PhD student at University of California, Davis. She proposes to use the scholarship to compare the early Upper Paleolithic tools from Mongolia with ones from Nwya Devu on Tibetan Plateau This research will lead to a discussion of the cultural transmission and modern human dispersal between Northern Asia and East Asia.

## **UPCOMING EVENTS**

### ***SAS Webinar***

*July 18, 2020*

*2:00 p.m.*

#### **“Mound Builders of North America” by Lynette Blumhardt**

From the Great Lakes to the Gulf of Mexico, indigenous people of North America lived, farmed and built earthworks. Their complex cultures thrived for thousands of years, from between 4000 BCE to the 17<sup>th</sup> century. Some of their earthworks are effigy mounds, others are domes, while the largest are earthen pyramids that rival those found in Mesoamerica.

In addition to learning about the mound builders’ sophisticated societies and cultures, we’ll take a closer look at several mound sites, including Watson Brake and Cahokia.

**Lynette Blumhardt’s** first introduction to anthropology was in the sixth grade when she read a National Geographic story about prehistoric humans who were described as eating woolly mammoth meat “with relish.” Although she couldn’t figure out how ancient people got their hands on a jar of chutney, she wasn’t deterred in her fascination with anthropology. Over the years, she took as many anthropology classes as possible and volunteered on more than a dozen archaeological excavations.

When not attending Sacramento Archeological Society events, Lynette maintains her sanity with other interests, including writing, gardening, and social distancing with friends. Lynette lives in Sacramento and has two grown sons and a very nice boyfriend

## ***SAS Webinar***

*August 15, 2020*

*2:00 p.m.*

**“How to Make Sense of OSL without a degree in Physics”**

**by Tom Johansen**

OSL (Optically Stimulated Luminescence) is a method used to date archeological sites and their associated artifacts. This technique uses the radiation dosimeter property of minerals such as quartz and feldspar. The method estimates when the mineral was last exposed to sunlight or sufficient heating. How does this technique really work? Tom will shine light on this topic.

**Tom Johansen, MD** studied electrical engineering at the University of Minnesota and his first career was applied physics research, engineering and engineering management. When he was fifty, he entered medical school and became an ophthalmologist. He has always had a fascination with physics and mathematics and digs into how things work and why they work the way they do. Tom has been president of SAS since 2018.

## ***SAS Webinar***

*September 12, 2020*

*2:00 p.m.*

**“Lovelock Cave Excavation – Its Contribution to the Science of Archaeology”**

**by John Foster**

Lovelock Cave (NV-Ch-18) is a North American archaeological site previously known as Sunset Guano Cave, Horseshoe Cave, and Loud Site 18. The cave is about 150 feet long and 35 feet wide. Lovelock Cave is one of the most important classic sites of the Great Basin region because the conditions of the cave are conducive to the preservation of organic and inorganic material. John will discuss the exploration of Locklock Cave and highlight its significance in the evolving discipline of archaeological excavation.

**John Foster** attended UC Santa Barbara as an undergraduate and transferred to UCLA where he graduated in with a degree in Anthropology. He continued his studies at Long Beach State, where he was awarded an MA degree in 1973. He continued his graduate studies at the University of Arizona before returning to California to begin his career with State Parks. In 1975 John accepted a position work in the Cultural Heritage Section of State Parks in Sacramento. He became the assistant archaeologist to Francis A "Fritz" Riddell, the first California State Archaeologist hired outside an academic setting. He was assigned to "ride herd on the cultural resources of the State Park System," and that has allowed him to record, investigate and preserve historic sites and archaeological features throughout California. Prehistoric rock art became a special interest to him because it allows a glimpse into the world view of its creator. John was president of SAS for seven years and continues to be a board member.

## PAST EVENTS

### *Scholar Webinars*

On May 9, 2020 we held our first webinar. **Bee Thao**, a master's student at Sonoma State University presented "Creating a historical context for Asia/Asian American Women- Sifting ID of Asian/Asian American Women in Sonoma". She offered historical background for the diverse nationalities (native-American, Chinese, Japanese, Filipino, Italian and Mexican) supporting the agricultural economy of the Sonoma County area in the early 1900's. The goal of her research was to create a historical context for Asian/Asian American women living during this period. She researched ethnographical information and found that census records were not very reliable, Names were misspelled. Race or ethnic background was often incorrect. In addition to her research of ethnographical information she interviewed two Japanese and two Filipino women. She concluded that Asian/Asian-American women were empowered actors in their lives. They performed acts and agency to adjust to the social, cultural and political times.

Our second presentation on May 9<sup>th</sup> was by **David Cook**, a sophomore at University of California, Berkeley studying material science. He has an interest in archaeology and thus attended a field school at Aidonia in Nemea, Greece. His presentation, "Aidonia, Greece" offered a short history of Mycenaean Greece from 1600 – 1200 BCE. This was followed by a discussion of the Aidonia cemetery and the excavation site. Finally he talked about 3D scanning of artifacts, a pig jaw, linear B tablet, and a phi figurine from the excavation.

On May 30<sup>th</sup> our student webinars continued with **Danielle Dadiago**, a graduating PhD student at University of California, Santa Cruz presenting her research. She started her presentation, "Local Adaptations to Colonial Economy" with a 17<sup>th</sup> and 18<sup>th</sup> century historical background for the Florida area. She spoke about the mission system, slaving of Native Americans, the trade difficulties exasperated by political conflict between Spain, France and Great Britain, and five sites: three presidios and two missions that have been excavated. Her research that she then discussed centered on the analysis of beads and lead shot from the sites. This research ascertains trade activity in the region during this period.

Also on May 30<sup>th</sup> **Sarah Foley**, graduate of University of California, Davis presented on her field school attendance last summer. In her presentation, "Field Season 2019 Saladina, Trou al'Wesse and Régismont-le-Haute she discussed each excavation. The two sites in Belgium were both caves with Neanderthal and *Homo sapien* habitation and the Régismont-le-Haute excavation was in the open in an area that has been traversed for centuries (40,000 years).

On June 20<sup>th</sup> the last set of 2019 Scholar recipients gave presentations via a webinar. **Candice Ralson**, a PhD candidate at University of California, Davis gave the presentation "Investigation of inter-site dietary patterns of early period populations in the Sacramento – San Joaquin delta - stable isotope evidence of Paleodiet at the Windmiller and Blossom Mounds". The Windmiller Mound (CA-SAC-107) represented a foothill site and the Blossom Mound (CA-SJO-68) a valley/delta site. In the presentation Candice offered a comparison of the diets of 21 subjects from her analysis of carbon and nitrogen in their bone collagen and apatite. This analysis, along with others such as strontium and sulfur of human bone and teeth will be used to complete her

dissertation research which aims to investigate post-marital residence and sexual division of labor for Early Period (ca. 5000-2500 BP) populations from the lower Sacramento Valley and San Joaquin Delta.

Also **Jonathan Garcia**, a graduate from Sonoma State University attended a Chico Archaeological Field School during the summer of 2019. This field school involved the excavation of a historic Native American village in the Northern Sierras and a shelter in the Great Basin. Jonathan shared his life changing experiences from his activity at each of these sites.

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## MEMBER'S CORNER

### *Members*

We wish to welcome Stephanie Duncan as our newest member. We hope to see her at our next Webinar.

We are saddened to report that SAS member, Michael Barham died on June 15 after a long illness. Our thoughts and condolences go out to his family and his dear friend, Diane Sangster.

### *Renewal of Annual Memberships*

All memberships are renewable on **January 1** annually except for those who join recently (after September of the previous year). Please support the society by promptly paying your **2020** dues. **Remember your dues make scholarships possible.** For more information use our web site <http://sacarcheology.org/society-membership/> to renew and make payment using a **credit card or Paypal.**

## ARCHAEOLOGICAL REFERENCES



The Dirt – A podcast for all ages and backgrounds about archaeology, anthropology, and our shared human story <http://thedirtpod.com>

### Recent Articles

The topics of the reviewed articles are:

- Hominins in South Africa between ~2.3 million and ~1.8 million years ago
- Broken Hill, Zambia *Homo heidelbergensis* skull 299,000 ± 25,000 years ago
- Bacho Kiro Cave (Bulgaria) *Homo sapien*/Neanderthal 46,790 to 42,810 years ago
- Neanderthals as fisher-hunter-gatherers - Gruta da Figueira Brava, Portugal ~86,000 to 106,000 years ago
- Wari Civilization, Peru about 600 to 1000 C.E
- Medieval kings and lead pollution

## "Contemporaneity of *Australopithecus*, *Paranthropus*, and early *Homo erectus* in South Africa"

**Introduction:** Drimolen is one of several ancient caves located in the Hominid Caves of South Africa United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Area in South Africa. Between ~2.3 million and ~1.8 million years ago, there were major climatic changes and faunal turnovers in the region, including the last occurrence of the genus *Australopithecus* and the first occurrence of *Paranthropus* and *Homo*, as well as the first occurrence of stone and bone tools. However the exact nature of these changes has been hard to elucidate because of past difficulties in dating caves of this age and their perceived geological complexity. Unlike in eastern Africa, where volcanic material is available for dating, the South African caves have been dated with a variety of evolving methods that have often given conflicting age estimates.

**Rationale:** Drimolen Main Quarry has yielded one of the richest records of early human fossils in South Africa, including examples of *Homo* and the most complete female skull (DNH 7) of *Paranthropus robustus*. Excavation between 2015 and 2018 yielded the first new hominin calvaria (DNH 134 and DNH 152) from the site in 20 years. A combination of uranium-lead dating on flowstones, uranium-series electron spin resonance (US-ESR) dating on teeth and palaeomagnetism on sediments was undertaken to establish the age of the site and its early human fossils.

**Results:** The DNH 134 cranium shares clear affinities with *Homo erectus*, whereas DNH 152 cranium represents *P. robustus*. Stratigraphic analysis of the Drimolen Main Quarry deposits indicates that unlike many other South African sites, there was only one major phase of relatively short deposition between ~2.02 million years ago and ~1.95 million years ago. This age has been constrained by the identification of the ~1.95 million year old magnetic field reversal at the base of the Olduvai SubChron within the sediments and by the direct uranium-lead dating of a flowstone that formed during the reversal. This has been augmented by direct dating on fossils by means of US-ESR that suggests that the DNH 134 and DNH 152 crania were deposited just before this reversal, with the DNH 134 crania deposit at ~2.04 million years ago. The DNH 134 cranium shares affinities with *H. erectus* and predates all known specimens in that species. The age range of Drimolen Main Quarry overlaps with that of *Australopithecus sediba* from the nearby site of Malapa and indicates that *Homo*, *Paranthropus*, and *Australopithecus* were contemporaneous in South Africa between 2.04 million and 1.95 million years ago. This is the first time that dating has conclusively demonstrated that these three taxa shared the same landscape during the same time range, making it less likely that a population of *A. sediba* is ancestral to *Homo*, as has been previously suggested." (Andy I.R. Herries, *et al*, *Science*, 2020-4-3 V 368, p. 47)

## "Dating the skull from Broken Hill, Zambia, and its position in human evolution"

"The cranium from Broken Hill (Kabwe) was recovered from cave deposit in 1921, during metal ore mining in what is now Zambia. It is one of the best-preserved skulls of a fossil hominin, and was initially designated as the type specimen of *Homo rhodesiensis*, but recently it has often been included in the taxon *Homo heidelbergensis*. However, the original site has since been



completely quarried away, and although the cranium is often estimated to be around 500,000 years old—its unsystematic recovery impedes its accurate dating and placement in human evolution. Archaeologists carried out analyses directly on the skull and found a best age estimate of  $299,000 \pm 25,000$  (mean  $\pm 2 \sigma$ ) years ago. The result suggests that later middle Pleistocene Africa contained multiple contemporaneous hominin lineages (that is *Homo sapiens*, *H. heidelbergensis*, *H. rhodesiensis* and *Homo naledi*) similar to Eurasia, where *Homo neanderthalensis*, the Denisovans, *Homo floresiensis*, *Homo luzonensis* and perhaps also *Homo heidelbergensis* and *Homo erectus* were found contemporaneously. The age estimate also raises further questions about the mode of evolution of *H. sapiens* in Africa and whether *H. heidelbergensis*/*H. rhodesiensis* was a direct ancestor of our species” (*Nature*, V 580, 2020-04-16, pp, 372-375)

### “Initial Upper Paleolithic *Homo sapiens* from Bacho Kiro Cave, Bulgaria”

“The Middle to Upper Palaeolithic transition in Europe witnessed the replacement and partial absorption of local Neanderthal populations by *Homo sapiens* populations of African origin. However, this process probably varied across regions and its details remain largely unknown. In particular, the duration of chronological overlap between the two groups is much debated, as are the implications of this overlap for the nature of the biological and cultural interactions between Neanderthals and *H. sapiens*. In this article they report the discovery and direct dating of human remains found in association with Initial Upper Paleolithic artifacts, from excavations at Bacho Kiro Cave (Bulgaria). Morphological analysis of a tooth and mitochondrial DNA from several hominin bone fragments, identified through proteomic screening, assign these finds to *H. sapiens* and link the expansion of Initial Upper Paleolithic technologies with the spread of *H. sapiens* into the mid-latitudes of Eurasia before 45,000 years ago. The excavations yield a wealth of bone artifacts, including pendants manufactured from cave bear teeth that are reminiscent of those later produced by the last Neanderthals of Western Europe. These finds are consistent with models based on the arrival of multiple waves of *H. sapiens* into Europe coming into contact with declining Neanderthal population.” (Jean-Jacques Hublin, *et.al. Nature*, V 581, 2020-05-21, pp, 299-302)

### “Last Interglacial Iberian Neanderthals as fisher-hunter-gatherers”

“The first record of significant marine resource consumption among Europe’s Neanderthals has been found in Gruta da Figueira Brava, one of the caves in Arrábida, a littoral mountain range 30 km. south of Lisbon, Portugal. The archaeological sequence dates to ~86,000 to 106,000 years ago. Throughout, there is evidence of a settlement-subsistence system based on regular exploitation of all animal resources offered by the coastal environment: large crabs, marine mollusks, fish, marine birds and mammal, tortoise, water-fowl, and hoof game. The composition of the food basket and the structure of the deposit vary as a function of the following: (i) sea-level oscillation, with implications for ecosystems that were preferentially targeted; (ii) frequency of human occupation; (iii) site-formation process; and (iv) position of the archaeological trenches relative to the changing configuration of the inhabited space. The initial occupations, when the sea was closer to the cave (~750 m) include shell-supported accumulations. The occupations were followed by a period of infrequent use and a final phase,



when the shoreline was ~2000 m. away but shellfish were again discarded at the site in substantial amounts.” (J. Zilhão, *et al.*, *Science*, V. 367, 2020-03-27, p. 1443)

## “Engineering an Empire

### Ingenious water management helped the ancient Wari state expand throughout the Andes. Why couldn't it survive a drought?”

“Wari colonists expanded into the Moquegua Valley of southern Peru some 1400 years ago. The Wari takeover was violent in places; the invaders sacrificed local people and displayed their heads as trophies. Rather than trying to seize the fertile valley floor, where people already lived, the newcomers occupied high, dry land that no one else had figured out how to use. They constructed their government and religious buildings on top of a high mesa, now called Cerro Baúl, and erected canals and aqueducts that carried water much farther than any previously attempted in the valley. They carved mountain slopes into agricultural terraces, which efficiently trapped and distributed water from rain and snow-melt to plots of maize, quinoa, and peppery berries called molle. People from several other regions moved to the new farms and towns, forming a powerful labor force that helped maintain the sprawling water infrastructure. This innovative hydraulic engineering enabled Wari—which some scholars argue was South America’s first empire—to expand and thrive for some 400 years despite an often dry, drought-prone climate.

Upon examination of bodies in cemeteries in the Moquegua area, archaeologists found that those buried after Wari colonists arrived showed no signs of increased violence. Instead, the valley’s peoples—Wari, Tiwanaku, and local Moquegua communities—appear to have coexisted from about 600 to 1000 C.E., each preserving its own style of pottery, architecture, temples and burials. Those studying the Wari state’s rise and fall, however, confront a puzzle. Its end, about 1000 years ago, appears to have coincided with a severe drought. By the time the drought reached the Moquegua valley in the 11<sup>th</sup> century, archaeological evidence suggests the Wari colony at Cerro Baúl was already weakened. Around 900 E. after centuries of relatively separate coexistence, more Tiwanaku villagers started to move into Wari territory, as shown by the remains of Tiwanaku-style houses, ceramics and cemeteries. Small Tiwanaku temples appeared on top of abandoned Wari agricultural fields, suggesting parts of the canal system were no longer functioning. Around 1050 C.E, the administrative and religious Wari buildings on top of Cerro Baúl were abandoned, after an “end of times” party.

Ironically, Wari engineering long outlasted the state itself. Beginning in the 1300s, the expanding Inca Empire repurposed Wari canals, roads and agricultural terraces to feed and connect their far-flung territories. Some of the ancient terraces, with their Incan and Wari roots, are still in use today.” (Lizzie Wade, *Science*, V. 368, 2020-04-20, pp. 235-237)

## “Lead pollution tracks the rise and fall of medieval kings

### Ice core preserves precise record of lead dust from English mines”

“In the Peak District of England, the picturesque village of Castleton nestles at the foot of a limestone outcrop. 800 years ago, the wild moors and wooded gorges were “covered in toxic lead pollution,” says archaeologist, Chris Lovelock of the University of Nottingham. Here, farmers mined silver and smelted so much lead that it left toxic traces in their bodies—and winds blew lead dust onto a glacier 1500 kilometers away in the Swiss Alps. Loveluck and his

colleagues say the glacier preserves a detailed record of medieval lead production. Lead tracks silver production because it is often found in the same ore. They report in a study published in *Antiquity*, lead spiked when kings took power, minted silver coins and built cathedrals and castles. Lead plunged when plagues, wars or other crises slowed mining and the air cleared.

In collaboration with Loveluck and historians at Harvard University, glaciologist Paul Mayeski and his team at the University of Maine, Orono analyzed lead in an ice core drilled in 2013 in the Colle Gnifette Glacier in the Swiss Alps. The 72-meter-long core preserves more than 2000 years of fallout from pollution, volcanoes, and Saharan dust storms. To decipher this record at the highest possible resolution, the team used a laser to carve 120-micron slivers of ice, each representing just a few days or weeks of snowfall, along the length of the core. They analyzed the samples—some 50,000 from each meter of the core—for about a dozen elements, including lead. The ice core data reveal the scale of regional pollution, showing dramatic lead spikes between 1170 and 1219 C.E.—“the highest level of lead pollution before modernity”. To find the source of the medieval spikes the team modeled how winds carry pollution. They found that during summer lead-laced winds blew to the glacier from the northwest—from England. Summer, between spring and fall harvests, was also when Peak District farmers mined the most lead. Women and children were breaking the rocks and smelting the ore in Castleton and the lead was getting picked up and transported over the western Alps

At a 2018 workshop at Harvard, the geo-scientist and historians found they could match lead pollution in the Swiss ice core, taxes paid and events in English history. For example in 1170 lead plummeted. It was the year that Henry II's assassins killed the archbishop of Canterbury and Henry was excommunicated. Nobody paid taxes. Ten years later lead pollution peaked. That's when Henry II began to bankroll the rebuilding Cistercian abbeys. He had massive lead orders for building roofs, gutters, and taxes on mines. Lead in the core surged again in 1193 when Richard (“the Lion heart”) was imprisoned in Germany by the Holy Roman Emperor Henry VI, who demanded a ransom. For miners and their families, economic good times—when lead production spiked—may have also spurred devastating health effects, say Loveluck who is part of an on-going study of Castleton skeletons.” (Ann Gibbons, *Science*, V. 368, 2020-04-3, pp. 19-20)

## “Accurate compound-specific $^{14}\text{C}$ dating of archaeological pottery vessels”

“Pottery is one of the most commonly recovered artifacts from archaeological sites. Despite more than a century of relative dating based on typology and seriation, accurate dating of pottery using the radiocarbon dating method has proven extremely challenging owing to the limited survival of organic temper and unreliability of visible residues. In the article the authors report on a method to directly date archaeological pottery based on accelerator mass spectrometry analysis of  $^{14}\text{C}$  in absorbed food residues using palmitic ( $\text{C}_{16:0}$ ) and stearic ( $\text{C}_{18:0}$ ) fatty acids purified by preparative gas chromatography. The present accurate compound-specific radiocarbon determinations of lipids extracted from pottery vessel, which were rigorously evaluated by comparison with dendrochronological dates and inclusion in site and regional chronologies that contained previously determined radiocarbon dates on other materials. Notably the compound-specific dates from each  $\text{C}_{16:0}$  and  $\text{C}_{18:0}$  fatty acids in pottery vessels provide an internal quality control of the results and are entirely compatible with dates for other commonly dated materials. In this article they used the method to date the exploitation of dairy

and carcass products in Neolithic vessels from Britain, Anatolia, central and western Europe and Saharan Africa.

For example the radiocarbon dates on the earliest dairying residues suggest that the practice of using dairy began in 5385 – 5224 cal. BC and probably arrived with the earliest farmers in the areas of Poland, France, Germany and the Netherlands. Thus, the linking of fatty acid structures with compound- specific carbon isotope values and CSRA (Compound specific radiocarbon analysis) dates provides a powerful means of directing dating prehistoric foodways and their introduction.

In another investigation pottery from the Sahara Dessert was analyzed. The Takarkori rock shelter, located in the now hyper-arid area of the Acacus Mountains, southwest Libya, demonstrates evidence of animal exploitation based on rock art and archaeological finds. Previous work revealed abundant adipose and dairy fat residue in fragments of the pottery vessels. Stratigraphy and radio carbon dating a range of materials (bone collagen, charred plant remains, dung, skin and enamel bioapatite) placed deposits associated with Middle Pastoral pottery in the sixth-fifth millennia cal. BC. The fatty acids from 5 potsherds, containing dairy fat produced ages between  $5,993 \pm 28$  BP and  $5,085 \pm 24$  BP. The CSRA dates were proven to be entirely compatible with the currency of Middle Pastoral Neolithic ceramics.” (Emmanuelle Canova *et al. Nature*, V 580, 2020-04-23, pp, 506-510)