



# SCAN

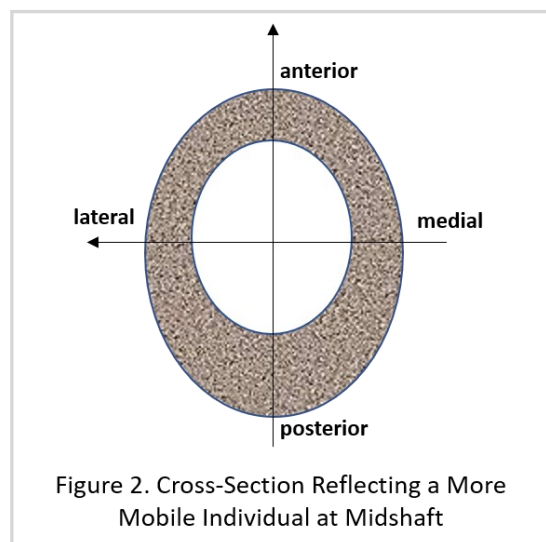
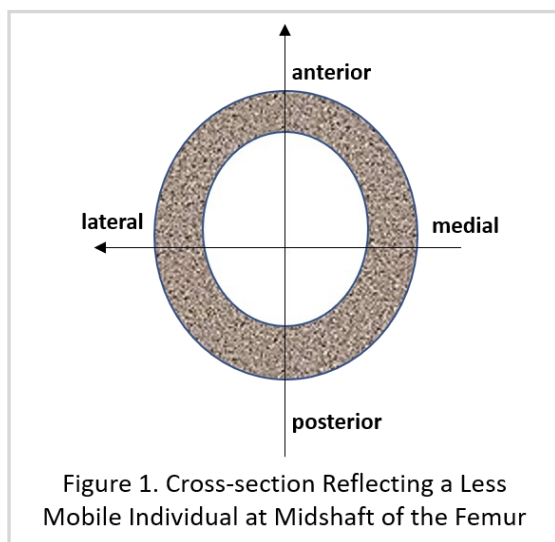


*The Santa Cruz Archaeological Society Newsletter—Spring 2020*

## MOBILITY THROUGH DROUGHTS: CROSS-SECTIONAL ANALYSIS OF FEMORA IN A SAN FRANCISCO BAY AREA PREHISTORIC NATIVE POPULATION by Sarah Luce

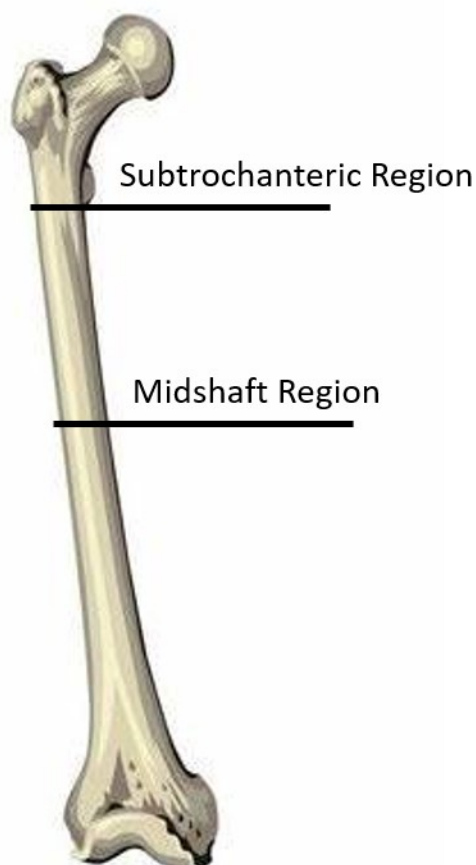
Researchers have studied the impact that the warming period, or Medieval Climatic Anomaly (900 A.D.- 1250 A.D.) had on Native California populations for decades. These studies have largely included analyzing collections to infer resource intensification through archaeological assemblages and isotopic signatures in teeth. In 2019, San Jose State University Graduate Alum Sarah Luce studied bone remodeling through analyzing cross-sectional geometric properties of femoral bone in a South San Francisco Bay Area village site to infer mobility patterns before and during the warming period.

When recurrent dynamic stress loads are placed on bone through surrounding muscle contraction (i.e, hiking, climbing, swimming etc.), the bone also contracts, which prompts remodeling, or growth of cortical (compact) bone, to accommodate that stress and strain. In relatively sedentary populations, the cross-section at the midshaft of a femur will look more circular (see Figure 1\*). Bone remodeling research on femora in ancient populations from around the world has shown that nomadic populations tend to have more oval cross-sections at the midshaft indicating greater mobility (see Figure 2\*). The researcher hypothesized that individuals representing the warming period would have thinner cortical bone in two regions of the femur in comparison to the individuals representing the period before the warming period, indicating less mobility possibility due to resource stress.



\*Figures are conceptual only and not true to femoral cross-sectional shapes.

One femur per individual was utilized for the study. No individuals aged below 18 years were included in this sample to exclude individuals without mature skeletal elements. X-rays were taken both anteroposteriorly (front to back) and mediolaterally (side to side) of the femora including 26 individuals representing the Middle Period (1100-900 years Before Present, as assigned by Leventhal in 1993) and 51 individuals representing the warming period, or, Late Phase 1 Period (900-450 years Before Present, as assigned by Leventhal in 1993). The researcher measured cortical bone thickness in millimeters at the medial, lateral, anterior, and posterior portions of each femur at the subtrochanteric and midshaft regions (see Figure 3).



**Figure 3. Anterior View of a Right Femur with Cross-section Locations**

Geometric formulae were used to calculate each cross-section's structural resistance (total area and cortical area), bending strength (second moment of area), and torsional strength (polar moment of area). The formulae used in the study and other cross-sectional studies have typically been borrowed from standard engineering and biomechanical theoretical models. The formulae that are used to study structures like building beams can be applied to bone because they are load (weight) bearing and relatively hollow.

Results of the study demonstrated significant changes in mobility over time. Anteroposterior robusticity (or cortical bone thickness) in the subtrochanteric region decreased from the Middle Period to the Late Phase 1 Period in males. Conversely, anteroposterior robusticity in the

midshaft region increased from the Middle Period to the Late Phase I period. These findings indicate that males shifted from engaging in dynamic activities that caused more bone remodeling in their upper leg/hip region (i.e., squatting) in Middle Period to engaging in dynamic activities that caused more bone remodeling at the midshaft of their femur (i.e., hiking, carrying heavy loads).

The opposite trend was observed in females. Anteroposterior robusticity at the subtrochanteric region increased from the Middle Period to the Late Phase I period while anteroposterior robusticity at the midshaft region decreased. These findings indicate that females shifted from engaging in dynamic activities that caused more bone remodeling at the midshaft of the femur

(i.e., hiking, carrying heavy loads) in the Middle Period to engaging in dynamic activities that cause more remodeling in their upper femoral/hip (i.e., squatting) region during the warming period.

In summary, the data suggests that the hypothesis had to be rejected; individuals representing the warming period were not found to have thinner cortical thickness compared to the Middle Period. Males became more mobile over time while females became less mobile. There are several possibilities that may explain the results. It is possible that activity patterns shifted from males dominating local subsistence labor and females traveling to gather resources during the Middle Period to males travelling farther for resources (i.e., hunting and trading) while females took over local subsistence activities during the warming period. Activity patterns may have also gradually shifted due to cultural values, socioeconomic changes, or population growth.

Another possibility is that the individuals within the study represent two different ethnic populations. Results from a study that looked at observable skeletal traits (differences in bone structure) in a sample from the same Bay Area site, but representing the Middle Period and the Late Phase II period (after the warming period), suggested that the individuals were two different ethnic groups (Weiss, 2018). Although the study did not look at any Late Phase I individuals, it is possible that the results of the cross-sectional study are due to different genetics that would impact bone mass and skeletal development.

More cross-sectional research should be done in similar populations in the region to gain a better understanding of what the results of the study can tell us. The researcher would like to extend the deepest respect to the likely decedents of those studied within the thesis, the Muwekma Ohlone.

Leventhal, A. M. (1993). *A Reinterpretation of Some Bay Area Shellmound Sites: A View from the Mortuary Complex from CA-ALA-329, the Ryan Mound* (Master's Thesis). San José State University, San José, CA.

Weiss, E. (2018). Biological distance at the Ryan Mound site. *American Journal of Physical Anthropology*, 165(3); 554-564.

## **Santa Cruz Archaeological Society Reaches Out to Students at Lakeview Middle School, part of the Pajaro Valley Unified School District, in Watsonville, California. By Annamarie Leon Guerrero**

On February 27, 2020, I participated in a career day event at Lakeview Middle School, part of the Pajaro Valley Unified School District, in Watsonville, California. The career day was sponsored by the non-profit organization Your Future is Our Business, which helps students explore a variety of career opportunities. Your Future is Our Business partnered with Lakeview Middle School, which has a predominantly Latinx student population and has traditionally been underserved. The coordinators of the event arranged it so that each class received a 22-minute presentation from at least two professionals from different career backgrounds.

For many of the students, if not most, this was likely the first time that they had ever heard of an archaeologist. Such career days are a great way to introduce young students to the existence and concept of archaeology. It also helps to dispel the notion that archaeology is an obscure profession--that it is something done in faraway places (though it can be). Participation in career days illustrate that archaeology exists everywhere humans have lived or affected, conveys the importance of the profession, provides a great forum to explain why students should become involved in the field, and illustrates that archaeology is an attainable career that can be practiced on a local, national, or international level.

My presentation gave a glimpse into what it is actually like to be a California archaeologist working in the field of cultural resources management. I tried to paint a picture of what an average day on the job looks like, what classes I took in school that are helpful, and why archaeology is relevant to everyone and their daily lives. I hope that by participating in career days it encourages a more diverse group of individuals to become involved in the field of archaeology. Even if these students do not actually become archaeologists, I hope that it sparks an interest with them that will encourage them to want to help protect and value cultural resources overall.



Photo courtesy of the Lakeview Middle School Facebook page: [https://www.facebook.com/pg/YourFutureIsOurBusiness/photos/?tab=album&album\\_id=2797444767016289](https://www.facebook.com/pg/YourFutureIsOurBusiness/photos/?tab=album&album_id=2797444767016289)



## **Artifacts of Mystery Origin (aka lack of provenience)**

by Robyn Houts

Two artifacts recently made their way to Chitactac. I have photographed them and they are shown below. They have apparently been through several hands and were thought to originate in the Bay Area. That has now changed to maybe Nebraska. The stone axe has a unique bluish fine granitic composition so I thought getting the word out we may find someone who knows the area of origin. The accompanying hand-tool appears to be a more generic chert but fits comfortably in my hand with a thumb position. Let me know if you have any leads.

Robyn Houts [scfarpacas04@yahoo.com](mailto:scfarpacas04@yahoo.com)



## *Chitactac In The Age of Codes 101040, 101085 and 120175, a Chitactac Photo Essay by Robyn Houts*

Between rain showers today, 6 April, 2020, I did the five minute trip from the farm over to Chitactac. I wanted to assess access to the site during the Covid-19 Pandemic Shelter in Place orders. I have volunteered at CA-SCL-57 for the past 22 years since it opened in its current format in 1998. School Programs are currently suspended but the Park is open with limited access. The photos are taken in order around the walking loop, for those of you who have experienced the site.

The Interpretive Shelter and picnic areas are closed, and the drinking fountain taped up. New signage covers the various codes under which we are all temporarily operating during the Covid-19 Pandemic. Although there were three other cars in the parking lot, I was the only person on the trail, so keeping six feet of “social-distance” was not difficult.

After the driest February in 165 years, with no recorded rain, March and now April have supplied us with plentiful rainfall and Santa Clara County has greened. Chitactac is vibrant with all the shades of green that Spring in this part of the world has to offer, including an abundance of brilliant green poison oak spilling over the rails and into the pathways.

If you find yourself on a necessary journey near this site, it is a useful wayside stop as well as an important Ohlone/Amah Mutsun site.



*Chitactac: New signage for Covid-19 Codes. Signs face the parking lot.  
(All photos by Robyn Houts. )*





*Bedrock Mortars filled with rain at the Interpretive Shelter Amphitheatre.*



*A fallen tree has been cut and cleared.*



*Uvas Creek flows with silt during the current weather system and has risen a couple of feet. The fallen tree has been removed from the rock with the petroglyph although some fallen wood remains (lower left.) Moss growth at this time of year makes the petroglyph all but invisible.*





*The Rock. Fallen trees have resulted in increased visibility to The Rock and to Uvas Creek.*





*A gnarly old Valley Oak.*



*Graffiti Rock. This rock, above the Lower Amphitheatre has attracted countless graffiti. It is mercifully free of graffiti in the current conditions of minimal visitation and seasonal mossy growth.*



*Lupines along the curb at the Watsonville Road entrance to the parking lot.*





# Ancient History



## ***SCr-107—Public Archaeology In Action***

***by past Editor Micki Farley*** (transcribed from the *SCAN* Vol 4, No 2, March 1975)

Frenetic activity is currently centering around a partially destroyed, Ohlone cemetery in the Pajaro Valley that may prove to exemplify the need for archaeological preservation policies. Some confusion has been expressed as to the chronological order of events and initiators of various actions on the site; therefore a great deal of space will be allowed in this otherwise necessarily short issue to put SCr-107 in perspective.

Approximately one and one-half years ago, prior to any established environmental review process, property owner Aaron Berman received a permit to grade and erect warehouse on a knolled site adjacent to Watsonville Slough. In December 1974, he applied for rezoning the remainder of his property at the same location from agricultural to commercial, in order to build additional warehouses. This time the application was automatically reviewed by the County Planning Department's Environmental Review Committee, and County Archaeological Advisor Rob Edwards recommended a survey of this highly sensitive location. Kit Smith directed a survey on December 18th, assisted by Michael Townsend and Allan Lonnberg—all three UCSC students and SCAS members, — and Micki Farley. The presence of a site was obvious, and closer inspection revealed traces of midden scattered over the area then in the process of construction permitted by the old permit, extending in dense concentrations several hundred feet towards the confluence of Watsonville and Struve Sloughs. A great deal of soil had been removed from the knoll and spread over the lower portions of the property by this time. The presence of an archaeologist was recommended while previously scheduled trenching operation took place, in addition to a thorough archaeological investigation of the property up for rezoning. It was not until January 21st that the County Board of Supervisors signed a contract with SCAS to provide preliminary archaeological reconnaissance of all parcels selected by the Environmental Review Committee, thus, insuring that areas of high archaeological potential would hereafter be recognized and examined in the earliest stages of the planning process. On February 21th, the contractor, George Davis, notified Rob Edwards that trenching would take place on the following Wednesday, at which time Rob was committed to conferences in San Luis Obispo with Native American groups regarding the roles and responsibilities of archaeologists and Indians in cemetery salvage situations. A team of experienced students was selected by Dr. John Fritz of UCSC, the institution responsible for further investigations during the Spring quarter, to observe trenching operations on the heavily disturbed site and to notify the operator if skeletal remains or artifacts were in danger of disturbance. On February 19th trenching began, with Kit Smith, Joe Morris and Cliff Hathaway in attendance. Within minutes the trencher spewed bone to the side of its operations, and when observers realized that six graves had been destroyed in rapid succession, the operator and foreman were notified that a legal cemetery lay under the site. When the dust and tempers had cleared, it was revealed that previous construction activities had removed all but three inches of midden and a series of clearly defined burial pits intruded into the reddish-gold sandy, sterile soil. During the next two hours, the students notified John Fritz, attempted to contact the County Coroner, Planning Department and the contractor, consulted legal requirements, notified SCAS and the Pajaro Valley Historical Association while they returned to classes, and discussed the implication of the discovery at length with foreman Red Craney. Everybody in the County was out to lunch except Jim Doane of the Planning Department, who began checking the County's



responsibility in the matter. Lee Otter of the Coastal Commission staff regretted that the area was outside the coastal zone, but provided assistance in locating responsible people. The result of all this phoning and statute-citing as that Ken Boyd, County Environmental Planner, upon emerging from a Planning Commission meeting was besieged by dozens of calls and immediately responding by obtaining a stop-work order.

Work (already completed on the footing trenches) ceased, the burials were carefully marked, measured in from a datum and covered. A conference between the contractor, the County, UCSC and SCAS was held the following day in Ken Boyd's office to negotiate a plan for proceeding. The County accepted all responsibility for stopping work, and the contractor (Davis) agreed to postpone building on the area of the cemetery until archaeological removal of burials already damaged and any that would be directly impacted by continuation of septic line trenches was effected. It was made clear that the wishes of local descendants of the Ohlone determined reinternment. The time limit on excavation was complicated by the fact that the owner had rented the warehouse effective March 15th, by which time the septic tank must be in operation or the tenant would be obligated to rent elsewhere. Work was allowed to proceed on the lower warehouse, which was to be built on fill already scraped from the surface of the cemetery area. All those present were cautioned as to the effect publicity would have on an exposed site inconvenient to surveillance, dealing with the sensitive issue of a Native American cemetery, and staffed by volunteers would could provide labor only after primary work and school obligations had been carried out. Volunteer labor was recruited through UCSC, Cabrillo College, Pajaro Valley Historical Association and SCAS, and workers laid out units and set to work through the next few days, aided at times by Retha and Les Berman.

*To be continued in the next issue...*

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