A Unique Asphaltum-Coated Brownware Pot

Henry C. Koerper, Richard Gossett, and Jerry Schaefer

Abstract

A brownware ceramic pot was recently received by the Pacific Coast Archaeological Society from the estate of Malcolm Farmer. Chemical analysis demonstrates that black material covering a majority of the specimen's surfaces is asphaltum, thus providing documentation for the only published, if not the only known, asphaltum-coated brownware vessel. This essay addresses questions regarding why bitumen was applied to the pot, acquisition of the tar, and the artifact's provenance.

Introduction

The Pacific Coast Archaeological Society (PCAS) recently received books, papers, and artifacts from the estate of Malcolm Farmer (see Anonymous 2012). It was understood that subsequent disposition of those effects would occur under the purview of the PCAS Board of Directors.

Among the varied items was a flowerpot-shaped, fired clay vessel (Figures 1–5). The specimen drew immediate attention for its extremely crude construction (very lumpy outer walls and conspicuous asymmetry), but especially for an appearance of having acquired some amount of bituminous tar, perhaps as a constituent of the pot's paste or possibly as a surficial application.

This homely artifact entered PCAS custody absent any record of provenance. The vessel was not accompanied by other kinds of artifacts that might offer clues as to either specific or general location of manufacture. The number "28," oversized by conventional cataloging standards, adorns an outside surface (see Figure 1). Applied in white ink, the number was covered over with a clear sealant. Presumably the numeral is a catalog number, but it is unknown whether it relates to a museum collection, site collection, or private collection.

For various reasons the PCAS Board requested that descriptions and discussions of the specimen be disseminated prior to the object's accession by a curatorial facility, either a museum or interpretive center, where other researchers could examine the piece and where it might be displayed. Accordingly, Professor Farmer's pot is herein described and compared to similar pots to address the question of provenance.

Special attention is given to testing whether the tarry-looking material is actually asphaltum, and thought is given to the source of the material. Our essay will end with a summary section.

Description

Shape and Manufacture

Symmetry was obviously compromised in the fashioning of Malcolm Farmer's pot. With its uneven base set flush, but only imperfectly, to a horizontal plane, a height differential is apparent from one side to another. Maximum height measures 127 mm, and minimum height is 116 mm. Base circumference is irregularly circular (Figure 2), maximum diameter being about 82 mm and minimum diameter being about 76 mm.

Figure 1. Ceramic pot from the estate of Malcolm Farmer. Maximum height of specimen is 127 mm.

Figure 2. Bottom of the pot.

Immediately recognized is that the pot was not a product of paddle-and-anvil manufacture; internally, there are no anvil marks, and externally, the walls are devoid of any smooth, balanced curvature that might play well to eye appeal. With a flexible take on what constitutes "scraping," we assign Farmer's pot to the manufacturing category of coil-and-scrape; below we explain the caution in this assessment.

The base of the pot began as a mass of clay, finger worked into what resembled a lumpy pancake; clearly, the base did not take shape as a coil or coils of hand-rolled clay wound to an expanding circumference. At the outer border of the base, there seems to have been added an encircling strip of clay, finger pressed to meld together the two components. Each successive strip would have been joined against the one just below using thumb in opposition to fingers, building the pot upwards.

One small area on an inner surface shows telltale signs of joints not totally obliterated, that is, testimony to coiling. In other words, the vessel is not one big "pinch pot."

Further, there are no parallel scraping marks on exterior walls that might indicate shaping with an implement. Exterior scraping marks are characteristic of brownwares. If such marks were once present, finger smoothing and/or applications of the black substance had canceled out the evidence. The vessel gives the appearance of having been all hand modeled. The interior walls appear better finished than the outer surfaces, however, some of the relative smoothness was possibly caused by stirring contents with a spoon or stick, that is, causing "pot polish."

Wall thickness varies from about 8 mm to 17 mm (Figure 4). In one place at the exterior surface, a wall bulges noticeably outward in contrast to the side opposite. Perhaps this signals slumping occasioned by paste having been a bit too wet.

Maximum diameter of the specimen at its upper end is 116 mm. The approximately 36 cm circumference along the rim edge is roughly circular (Figure 5). Rim thickness is variable (max = 12.5 mm; min = 9.4 mm). The interior rim is moderately incurved, and the exterior rim ranges between barely outcurved to slightly outcurved. There are no fingernail or blunt stick indentations to decorate the lip underneath the rim or any other part of the artifact.

The pot weighs 524 g. Fired clay surface hardness averages about 4 on the Mohs scale. Black coating lying over the ceramic material has a hardness of ca. Mohs 1.

Coloration and Texture

Motley surface coloring (Figures 1–3) is another feature of Malcolm Farmer's pot, a circumstance that bespeaks firing in a poorly controlled, oxidizing atmosphere with poorly controlled temperature. Dull, earthy ceramic color ranges from brownish gray to dark gray, even black. Dull red comes through on some interior surfaces. Well over half of the outer walls and the majority of the base are coated with a substance that ranges in color from matte black to shiny black. We wondered whether some of the shininess had resulted from handling wear.

The fabric contains 25 to 50 percent small, well-sorted angular to subangular quartz grains, and substantial amounts of biotite mica are apparent on the surface. These characteristics typify clays from a residual source in the mountains or from colluvium in a valley (see Schaefer 2003). Any other trace minerals cannot be identified given the blackened and residue-covered surface. The exterior surface exhibits numerous vugs from vegetal fiber inclusions in the broken exposure (Figure 6). Enough fiber vugs appear to suggest deliberate fiber tempering.

Figure 3. Another view of Malcolm Farmer's ceramic pot.

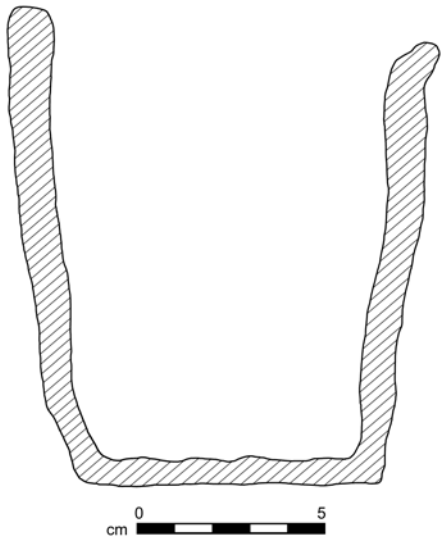

Figure 4. Cross section illustration of Malcolm Farmer's pot.

Provenance

The descriptive information presented above for Malcolm Farmer's pot is a match generally to criteria attending Riddell's (1951:20–23) definition of Owens Valley Brown Ware (OVBW). Also, assessment of how the pot might have been manufactured accords well enough with Julian Steward's (1933:267) witness of Owens Valley women making fired clay vessels; Steward observed the daughter of informant Jack Stewart and the mother-in-law of informant John Sumerville in their ceramic labors.

Both women would lay a flat, 3 in (7.6 cm) diameter piece of clay, made in the palm of the hand, onto a board. To this base each potter added "long narrow strips [of clay] rolled between the palms … pressing each strip to the one below it between the thumb and forefinger of the right hand in order to obliterate joints." As the walls built upwards, they were finger smoothed, the fingers having been dipped in mallow syrup. When this basic shaping was finished, there was final smoothing with fingers. Later, Jack Stewart's daughter painted syrupy mallow over the pot's exterior prior to baking with coals in an open, sagebrush fire (Steward 1933:267). Such syrup was described as thick, having been boiled out of desert mallow (*Sphaeralcea fremontii* Torr. Jepson). Stewart's daughter had also moistened her clay with the mallow syrup (Steward 1933:266–267; see also Steward 1941:242, 294).

Steward (1933:269) found close similarities between manufactures of his two Owens Valley potters to those of the Yokuts and Western Mono (Monache) informants of Anna Gayton (1929) (see Figure 7). Steward (1933:269) further observed that "Yokuts, Western Mono, Owens Valley, Humboldt Lake, and Tübatulabal pottery forms an area[1] within which distribution is continuous but not connected with southern California or the Southwest …" The literature of this larger area gives ample testimony for the

Figure 5. Interior view of the pot.

Figure 6. Close-up photograph of the surface of the pot showing vugs, which are evidence of probable vegetal temper.

occurrence of fired clay vessels similar to Farmer's pot (see e.g., Kroeber 1925:Plate 51; Gayton 1929: Plates 99–102; Steward 1933:Figure 1a–i, Plate 5 a, b, d; Underhill 1941:35; Lathrap and Meighan 1951:Plate 3a; Berryman and Elsasser 1966:Figure 8; Elsasser 1972:21; Smith 1978:443; Wallace and Wallace 1979:19–22; Liljeblad and Fowler 1986:421–422; Madsen 1986:Figure 6; Jackson 1990; Wallace 1990).

However, thick and squared-base vessels such as the Farmer pot are more typical of the western Sierra pots than the thinner vessels made in the Owens Valley (see Gayton 1929:Plates 99–102); the authors were advised to not ascribe Farmer's vessel to the OVBW category and to instead call it simply a brownware pot (Jelmer Eerkens, personal communication 2014). Also, Moratto (2013) provides the definitive study of OVBW, and his study says nothing about fiber temper.[2] He dates the plain, brownware pottery to the fifteenth or sixteenth centuries AD and later.

Within this greater geography, where was the Farmer pot made? Does its black coating offer a clue for assigning a tighter provenance?

Asphaltum

At first examination of Farmer's pot, one of us (HCK) sensed its paste may have contained asphaltum. Touching a lighted match against a small sherd that had broken out from the container's upper edge seemed to elicit a mild aroma of hydrocarbons as the fragment barely smoldered. The same treatment to a sample of beach asphaltum produced a more definitive petroleum smell as it slowly combusted, but also without any flame. Intense heat using a propane torch applied to the rim piece precipitated no viscous discharge, while similar treatment to the beach tar resulted almost immediately in an agitated output of shiny, black drippings. Neither the lighted match nor the torch when brought against the sherd generated

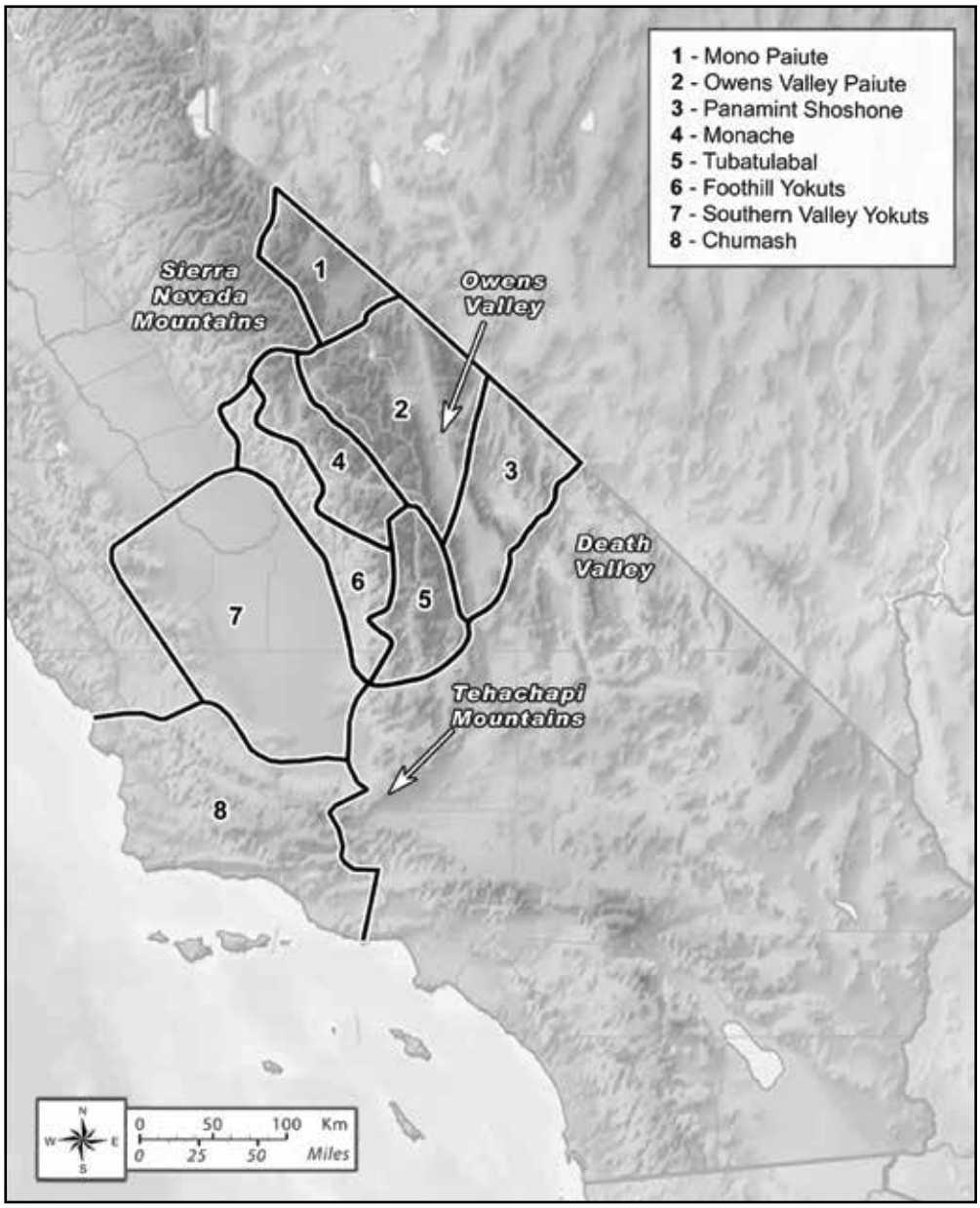

Figure 7. Tribal map.

a smell of volatized pine pitch or any other odor one might associate with certain resinous substances.

Another sherd was removed at the site of the pot's broken edge and submitted for chemical analysis in order to characterize any petroleum compounds. One of us (RG) directed that analysis which established the presence of petroleum compounds, that is, polynuclear aromatic hydrocarbons (PAHs). The appendix to this article provides the specifics of the testing and the test results. Interestingly, the pesticide DDT and its metabolites were detected in the sample

Other than Malcolm Farmer's pot, we are not aware of any Native American ceramic vessel reported from either the California or Great Basin culture areas that

exhibits asphaltum either as a constituent of the paste or as a surface coating.[3]

Why Asphaltum?

The pattern of differential tar distribution on Farmer's pot belies the idea that it functioned as an asphaltum crucible. Had it been a melting pot, the expectation would be for a salient presence of bitumen at the receptacle's lower interior, adhering especially to the base where, in fact, the black substance occurs unevenly. Rather, it is at the upper walls that the Indians' mastic/caulk concentrates. The entire rim is tar coated, as are much of the receptacle's outer walls, including the exterior base (Figure 2) where it appears thickest.

Kroeber (1925:537, Plate 51) gave short discussion of Yokuts pottery, distinctive for what he called "excessive crudeness." The Berkeley professor drew readers' attention to his Plate 51 in order to see "a row of vessels [appearing] as if produced by children or experimenters." We thought it curious for Kroeber (1925:537) to suggest that "glue, blood, or a sticky substance may have been introduced as binding material." Had Kroeber's idea of "glue" or "sticky substance" occurred because he had detected bitumen on a Yokuts vessel, or did it follow from his understanding that asphaltum was naturally available in the southern San Joaquin Valley (see Gifford and Schenck 1926:53; Hewes 1941:130; Wedel 1941:37–38; Heizer and Treganza 1944:333) and/or was available to lower Central Valley people and Tubatulabal via contacts involving southern California coastal peoples (see Voegelin 1938:30; Latta 1949:65; Sample 1950:20; Hudson and Blackburn 1987:165; also Davis 1974:28)?[4] In any case, we must ask whether asphaltum was an additive to the paste in Farmer's pot.

Close inspection reveals that the asphaltum is not a constituent of the paste, but rather it was applied as a coating. There are places on both the pot's outer walls and inner walls that show contrast of color/texture between uncovered fired ceramic surface versus bitumen covered ceramic surface. In one heavily asphalted outer surface area there is a small chip missing, revealing stark contrast between what is subsurface and what is surficial (Figure 8). Specifically, the subsurface shows a light colored paste, not impregnated with asphaltum. There are no indications of any sort of applicator, such as a soaproot brush, yet subsequent heating of the vessel perhaps obliterated evidence of brush strokes or evidence from some other kind of implement.

What purpose or purposes were served by applying a layer of viscous substance to the walls of a pot? When Steward's (1933:266–267; also Underhill 1941:35) Owens Valley pottery informants painted mallow syrup over their sun-dried pots prior to firing, one intent may have been to form a sealant (see Liljeblad and Fowler 1986:421). Steward (1941:242, 294, Item 1199 and 1200) added cactus juice to his previously noted mallow juice to help characterize the pottery of both Owens Valley and southern Death Valley. Before Steward (1933), Anna Gayton recorded that some Monache and Foothill Yokuts potters finished their vessels with a coating of thin acorn mush:

> Sufficiently fired pots were removed from the fire while at high heat and were immediately

Figure 8. Small chip missing from asphalted surface reveals that the pot's paste was light colored and therefore not impregnated with asphaltum.

> painted inside and out with acorn mush applied with a soaproot brush. The mush "sizzled and baked right into the pot." Three or four coatings were given. This process was said to prevent the clay from soaking up liquids, "sweating," and breaking. A similar coating is applied to cooking baskets to make them watertight. The Wükchumni Yokuts called this "doctoring" the pot [Gayton 1929:245].

We can offer no definitive statement regarding why asphaltum was painted onto Farmer's pot. Our suspicion is that it served as the functional equivalent of those above-mentioned vegetal applications (i.e., mallow syrup, acorn mush, cactus syrup); it made for a glossy, nonabsorbent surface. Following Gayton's (1929:245) informants, this perhaps offered what a potter believed was a prophylactic to breakage. Then again, the tar may represent cosmetic application, intended to smooth surfaces and/or provide colorant.

We offer no opinion as to whether the coating occurred prior to firing the pot, soon after, or subsequent to the pot having cooled off. There is the possibility, albeit remote, that asphaltum was applied at a location well removed from where the artifact was fired.

With consideration of ethnic groups' distances from natural asphaltum seeps, we tentatively favor manufacture of Farmer's pot among either Foothill Yokuts, Monache, or Tubatulabal over manufacture in Owens Valley Paiute territory. Also, it seems far less likely for any coastal asphaltum to have reached the Owens Valley people. Another possibility is that Farmer's pot was the product of commercially driven revival of the Death Valley potter discussed in our article's end note number 1. Had that potter's "exceedingly crude" (see Steward 1933:268) ceramics been "doctored" using a modern petroleum product?

Summary and Concluding Notes

An unusual ceramic pot was entrusted to the PCAS Board of Directors for determination of final disposition. Once part of Professor Malcolm Farmer's estate, the artifact raised questions regarding taxon, provenance, and the nature of the black substance covering well over half of its total surface area.

Determination of probable mode of manufacture and considerations of general morphology and surface topography assigns the specimen to the brownware category. Chemical analysis of the black surface material established that the coating was asphaltum. The tar was not a constituent of the paste.

To our knowledge, this is the only published fired clay receptacle from either the Great Basin or California culture areas that had been treated with bitumen. We suspect that the asphaltum was intended as a functional equivalent of certain vegetal, syrupy substances identified ethnographically for the manufacture of some pots, and if so, the intent was likely to provide a sealant that might protect the receptacle from breakage. Provenance remains an enigma. We cautiously favor the idea that Farmer's pot was crafted within the western geographic range of brownware production.

Addendum

Farmer's pot has now passed out of the custody of the PCAS, and it is presently curated by the Department of Anthropology, Natural History Museum of Los Angeles County.

End Notes

1. Steward (1933:268) included Death Valley within this area, mentioning "exceedingly crude" pottery made by an old Shoshoni man who had revived the pottery "art" commercially. Steward (1933:240,

Figures 1a–g) drew in outline nine of these pots owned by a Mr. Eickbaum, a collector who lived at Stovepipe Wells, Death Valley. All but one of the nine had flattish bottoms, and smoothing inside was accomplished with a stick or fingers and outside with fingers leaving deep irregularities. Steward imagined that the notable crudity could have been due to "modern degradation." Jackson (1990:169) referred to Steward's account as "culturally anomalous." Interestingly, Wallace and Wallace (1979:19, 21–22) published photographs of Death Valley pots that are a match to brownware ceramics. Were these of the "culturally anomalous" category, the handiwork of the Shoshoni potter who "revived" the art for commercial gain? The Wallaces' description of Death Valley pottery manufacture seems to have been borrowed from Steward (1941:242, 294), as they mention cactus or mallow juice, "probably boiled into a thick syrup … used to moisten the clay."

2. Moratto (2013:65) cautions that the OVBW ascription "may need to be changed or refined if sophisticated analyses, such as those undertaken recently in Owens Valley (Eerkens 2001, 2003) and Death Valley (Eerkens et al. 2002), are ever performed on the ceramics of the southern Sierra."

3. As a point of interest, there are two sources in the literature of south central coastal California that report receptacles made entirely of bituminous material. Ford (1887:14) noted a "shallow cup" made of asphaltum, a surface find from a Carpinteria site he excavated with R. F. Bingham in 1877 (Ford 1887:18). The site was almost certainly one of the mainland Chumash rancherias enumerated on October 15, 1542, by Bartolome Ferrela during the Cabrillo expedition (see Putnam 1879:307). From a Santa Cruz Island site comes "an extraordinary artifact," a 24 cm high x 35 cm across, basin-like object fashioned "entirely of high-grade asphaltum" (Arnold 1993:282–284). Arnold thought it might be "the largest asphaltum cultural object found in the New World." She proposed a storage function or a display function involving either some liquid or fine-grained material (e.g., pigment or seeds).

4. On their treks to the lower end of the southern Sierra Nevada, Ventureño carried cakes of solid asphaltum (Voegelin 1938:30; Hudson and Blackburn 1987:165; see also Davis 1974:28). Whether the tar cakes ended up in Tubatulabal hands as gifts for the privilege of collecting pine nuts or through standard barter is unclear. Then again, in California, sometimes the collecting of a resource from another tribe's land involved little more than asking permission to do so (Heizer and Treganza 1944:299; see also Davis 1974:8–10). Some Yokuts received tar via a Chumash connection (Latta 1949:65; Sample 1950:20). Some Chumash received tar from Yokuts (Davis 1974:28). It is likely that some of the asphaltum obtained by Tubatulabal had come from tar seeps in Yokuts territory (see Heizer and Treganza 1944:333).

Acknowledgments

We very much appreciate Zee Malas' preparation of the map of Figure 7. Joe Cramer helped prepare several of the figures. We thank the reviewers, Jelmer Eerkens and Don Laylander, for their very helpful comments.

References Cited

Anonymous
2012 Malcolm Farmer Remembered. *Pacific Coast Archaeological Society Quarterly* 46(3):47–60.

Arnold, Jeanne E.
1993 Chumash Technology: New Discoveries of Uses of Imported Redwood and Asphaltum on the Channel Islands. *Proceedings of the Society for California Archaeology* 6:277–285. San Diego.

Berryman, Lorin E., and Albert B. Elsasser
1966 *Terminus Reservoir: Geology, Paleontology, Flora & Fauna, Archaeology and History*. Inter-Agency Archaeological Salvage Program, U. S. Army Corps of Engineers, Sacramento/ National Park Service, San Francisco.

Davis, James T.
1974 *Trade Routes and Economic Exchange Among the Indians of California*. Ballena Press Publications in Archaeology, Ethnology, and History No. 3. Ballena Press, Ramona, California.

Eerkens, Jelmer W.
2001 *The Origins of Pottery among Late Prehistoric Hunter-Gatherers in California and the Western Great Basin*. Ph.D. dissertation. Department of Anthropology, University of California, Santa Barbara.
2003 Towards a Chronology of Brownware Pottery in the Western Great Basin: A Case Study from the Owens Valley. *North American Archaeologist* 24(1):1–27.

Eerkens, Jelmer W., Hector Neff, and Michael D. Glascock
2002 Typologies and Classification of Great Basin Pottery: A New Look at Death Valley Brownwares. In *Ceramic Production and Circulation in the Greater Southwest: Source Determination by INAA and Complementary Minerological Investigations*, edited by Donna M. Glowacki and Hector Neff, pp. 140–151. UCLA Cotsen Institute of Archaeology Monograph 44. Los Angeles.

Elsasser, Albert B.
1972 *Indians of Sequoia and Kings Canyon National Parks* (revised edition). Sequoia Natural History Association, Three Rivers, California.

Ford, Henry Chapman
1887 Notes on Excavations made in Indian Burial Places in Carpinteria. *Report of Proceedings of the Santa Barbara Society of Natural History* Bulletin 1 (March):11–18.

Gayton, Anna H.
1929 *Yokuts and Western Mono Pottery Making*. University of California Publications in American Archaeology and Ethnology Vol. 24, No. 3. University of California Press, Berkeley.

Gifford, Edward Winslow, and W. Egbert Schenck
1926 *Archaeology of the Southern San Joaquin Valley*. University of California Publications in American Archaeology and Ethnology Vol. 23, No.1. University of California Press, Berkeley.

Heizer, Robert F., and Aden E. Treganza
1944 Mines and Quarries of the Indians of California. *California Journal of Mines and Geology* 40(3):291–359.

Hewes, Gordon W.
1941 Archaeological Reconnaissance of the Central San Joaquin Valley. *American Antiquity* 7(2):123–133.

Hudson, Travis, and Thomas C. Blackburn
1987 *The Material Culture of the Chumash Interaction Sphere Vol.5: Manufacturing Processes, Metrology, and Trade*. Ballena Press Anthropological Papers No. 31. A Ballena Press/Santa Barbara Museum of Natural History Cooperative Publication, Menlo Park, California and Santa Barbara, California.

Jackson, Thomas L.
1990 Prehistoric Ceramics of the Southwestern Sierra Nevada, California. In *Hunter-Gatherer*

Pottery from the Far West, edited by Joanne M. Mack, pp. 159–170. Nevada State Museum Anthropological Papers No. 23. Carson City.

Kroeber, Alfred L.
1925 *Handbook of the Indians of California*. Smithsonian Institution Bureau of American Ethnology Bulletin 78. Government Printing Office, Washington, D.C.

Lathrap, Donald W., and Clement W. Meighan
1951 An Archaeological Reconnaissance in the Panamint Mountains. In *Papers on California Archaeology:10–12*. Reports of the University of California Archaeological Survey 11:11–30. Department of Anthropology, Berkeley.

Latta, Frank F.
1949 *Handbook of Yokuts Indians*. Kern County Museum, Bakersfield, California.

Liljeblad, Sven, and Catherine S. Fowler
1986 Owens Valley Paiute. In *Great Basin*, edited by Warren L. d'Azevedo, pp. 412–434. Handbook of North American Indians, Vol. 11, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Madsen, David B.
1986 Prehistoric Ceramics. In *Great Basin*, edited by Warren L. d'Azevedo, pp. 206–214. Handbook of North American Indians, Vol. 11, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Moratto, Michael J.
2013 Brownware Pottery of the Southern Sierra Nevada. *Pacific Coast Archaeological Society Quarterly* 47(1 and 2):65–84.

Putnam, Frederick W. (editor)
1879 Translation from the Spanish of the Account by Pilot Ferrel of the Voyage of Cabrillo Along the West Coast of North America in 1542. In *Report Upon United States Geographic Surveys West of the One Hundredth Meridian* Vol. 7, Pt. 1, edited by Frederick W. Putnam, pp. 293–314. Government Printing Office, Washington, D.C.

Riddell, Harry S.
1951 The Archaeology of a Paiute Village in Owens Valley. In *Papers on California Archaeology: 13–16*. Reports of the University of California Archaeological Survey No. 12. Department of Anthropology, Berkeley.

Sample, Laetitia L.
1950 *Trade and Trails in Aboriginal California*. Reports of the University of California Archaeological Survey No. 8. Department of Anthropology, Berkeley.

Schaefer, Jerry
2003 Petrographic and INAA Analysis of Southern Owens Valley Clays and Brown Ware Ceramics from the Olancha/Cartago Four-Lane Project. In *Lacustrine Lifestyles along Owens Lake: NRHP Evaluation of 15 Prehistoric Sites for the Olancha/Cartago Four-Lane Project, U.S. Route 395. Inyo County, California,* by Brian F. Byrd and Micah Hale, pp. 567–606. Report prepared by ASM Affiliates, Inc., Encinitas, California. Report prepared for the California Department of Transportation, Central California Cultural Resources Branch, Fresno, California.

Smith, Charles R.
1978 Tubatulabal. In *California*, edited by Robert F. Heizer, pp. 437–445. Handbook of North

American Indians, Vol. 8, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Steward, Julian H.
1933 *Ethnography of the Owens Valley Paiute*. University of California Publications in American Archaeology and Ethnology Volume 33, No. 3. University of California Press, Berkeley.
1941 *Culture Element Distributions: XIII, Nevada Shoshone*. Anthropological Records Vol. 4, No. 2. University of California Press, Berkeley and Los Angeles.

Underhill, Ruth
1941 *The Northern Paiute Indians of California and Nevada*. Branch of Education, Bureau of Indian Affairs, Department of Interior, Washington, D.C.

Voegelin, Erminie
1938 *Tübatulabal Ethnography*. Anthropological Records Vol. 2, No. 1. University of California Press, Berkeley.

Wallace, William J.
1990 Another Look at Yokuts Pottery-Making. In *Hunter-Gatherer Pottery from the Far West*, edited by Joanne M. Mack, pp.171–178. Nevada State Anthropological Papers No. 23. Carson City.

Wallace, William J., and Edith Wallace
1979 *Desert Foragers and Hunters: Indians of the Death Valley Region*. Acoma Books, Ramona, California.

Wedel, Waldo R.
1941 *Archaeological Investigations at Buena Vista Lake, Kern County, California*. Bureau of American Ethnology Bulletin 130. Government Printing Office, Washington, D.C.

Appendix

Four grams of material were extracted from the sherd using methylene chloride and then using Soxhlet extraction. This extraction procedure cycled clean solvent over the sample for ca. 12 hours, at which time the solvent was concentrated to less than .5 mL, and then 2µL were injected onto an Agilent 5975N Gas Chromatograph/Mass Spectrometer. The GCMS was equipped with a 60 m DB-5 column that was temperature programmed from 45°C to 285°C at 2.5°C/min.

Polynuclear aromatic hydrocarbons (PAHs) were quantified using an NIST-traceable standard; n-Alkanes, PAH Alkyl Homologs, Hopanes, and Steranes were analyzed qualitatively only. Finally, just by coincidence we discovered the presence of the pesticide DDT and its metabolites which were also quantified using an NIST-traceable standard, and polychlorinated biphenyls (PCBs) were also observed. DDTs and PCBs were manufactured starting in the 1940s but are highly lipophilic, and if this pot was buried in a location that was contaminated by these pesticides, they would readily dissolve into asphaltum associated with Farmer's pot. Table 1 contains the quantitative results for the pot samples.

The following figures present the ions associated with the PAH alkyl homologs. Briefly, these compounds represent the state of the petroleum compounds in terms of the amount of weathering of the tar. That is, if large amounts of the alkyl homologs are present, the petroleum would be fresh, and if they are lacking, then the petroleum would be highly weathered or degraded. For the sherd sample the alkyl homologs were low or not present, and the conclusion would be that the petroleum is highly weathered/degraded. Chromatograms revealed ions for the following PAH homologs: mass 128-, 142-, 156-, and 170-alkyl naphthalene homologs; mass 178-, 192-, 206-, 220-, 234-alkyl phenanthrene/anthracene homologs; mass 202-, 216-, 230-, 244-, and 258-alkyl fluoranthene/pyrene homologs; mass 228-, 242-, 256-, 270-, and 284-alkyl benz[a]anthracene/chrysene homologs; mass 252-, 266-, 280-, 294-, and 308-alkyl benzofluoranthene/benzopyrene/perlyeme homologs.

Table 1. Quantitative Results for DDTs and PAHs Detected in the Pot Sample in ng/g.

Parameter	Vase Concentration (ng/g)
4,4'-DDE	1130
4,4'-DDD	305
2,4'-DDT	3380
4,4'-DDT	16110
Naphthalene	2450
2-Methylnaphthalene	102
1-Methylnaphtrhalene	21.9
Biphenyl	21.3
2,6-Dimethylnaphthalene	21.9
Acenaphthylene	7.28
Acenaphthene	2.70
2,3,5-Trimethylnaphthalene	11.8
Fluorene	2.56
Dibenzothiophene	45.3
Phenanthrene	912
Anthracene	18.9
1-Methylphenanthrene	300
Fluoranthene	219
Pyrene	141
Benz[a]anthracene	26.2
Chrysene	69.4
Benzo[b]fluoranthene	36.8
Benzo[k]fluoranthene	31.1
Benzo[e]pyrene	21.2
Benzo[a]pyrene	12.0
Perylene	61.6
Indeno[1,2,3-c,d]pyrene	35.0
Dibenz[a,h]anthracene	9.41
Benzo[g,h,i]perylene	33.2