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REPORTS

Invoking Occam's Razor: Experimental Pigment Processing and an Hypothesis Concerning Emigdiano Chumash Rock Art

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In 1824, the coastal Chumash revolted against the oppressive mission system and some fled to the interior mountains. Lee (1979) has hypothesized that unusual pigments at the interior rock art site of Pleito Creek (CA-KER-77) may have been brought from Mission Santa Barbara during this revolt. Documentation between 1999 and 2003 included several studies designed to learn more about the makeup of these pigments. To test Lee's hypothesis, experiments with locally available minerals were performed in an effort to reproduce similar exotic colors. Ethnographic, ethnohistoric, and archaeological sources suggest traditional usages of these colors. Adopting Occam's razor and the principle of parsimony, the simplest explanation is that the exotic colors at Pleito Creek were made from pigments from local, nearby sources, rather than being imported from further afield. On the basis of superimposition analysis, the hypothesis is advanced that historic period rock art may have been made using an expedient, directly applied charcoal-black pigment

Occam's Razor is the philosophical concept that the simplest answer is usually the right one. This concept is synonymous with the idea of parsimony, or the idea that the most economical explanation for a given phenomenon is the most preferable. Occam's razor has a long history, particularly in the physical sciences (see Rodriguez-Fernández 1999), and it is a core principle of logical reasoning. In the social sciences generally, and in archaeology specifically, parsimony is often employed (whether implicitly or explicitly). While the concept of parsimony is certainly not always the best principle to apply to complex human behaviors and human social interrelationships (see debates on parsimony in Boyd 2004, Dunham 2003, and Hantman et al. 2004), it can be an effective principle when one is addressing specific, targeted questions or hypotheses. In this paper, we apply the razor to such an hypothesis—one famously proposed by the rock art specialist Georgia Lee (1979)—concerning exotic pigments found in pictographs at the site of Pleito Creek (CA-KER-77), Kern Country. In her article, Lee put forth the idea that atypical blue, green, and orange pigments of unusually high opacity at Pleito may have been brought from the coastal missions during the Chumash revolt of 1824 as part of an effort to "activate supernatural forces against the Spanish-Mexican intruders" (1979:295).

Lee, drawing upon Webb's (1952), Hageman's (1939), and Phillips' (1976) previous historical work, pointed to the fact that mission documents record requests for the purchase for malachite and azurite mineral pigments from Mexico for the painting of the missions by Chumash neophytes, and that there were instructions recommending the addition of gypsum or lime to increase color opacity (Lee 1979:303). These imported blue and green minerals certainly can be processed to produce green and blue pigments like those found in the pictographs at Pleito. It is well documented that some of the refugees from the revolt settled in interior south-central California in the Emigdiano Chumash region where Pleito is located (Fig. 1) (Bancroft 1966:528; Castillo 1999; Cook 1962; Latta 1976:211; Morgan 1914:33; Sandos 1985; Stickle and Cooper 1969). In addition, recent archaeological investigations have confirmed the presence of historical components at several Emigdiano sites, including the main village of *Tashlipun* (Bernard 2008), the pictograph site of Pinwheel Cave (Robinson and Sturt 2008), and (most importantly) at Pleito itself, where Grasse's excavations have found historical period

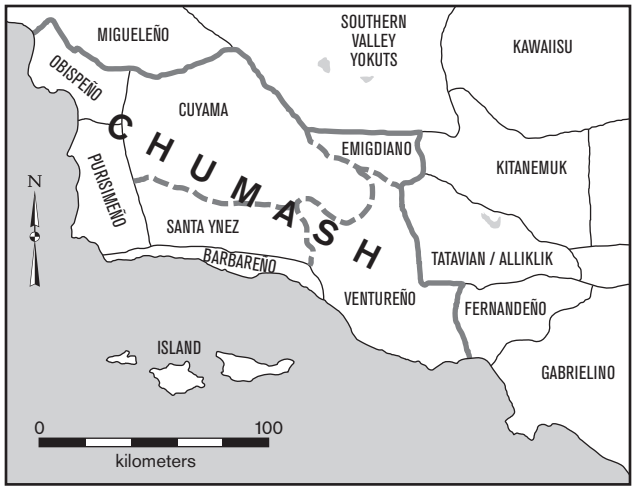

Figure 1. Location of Chumash Emigdiano territory.

beads and an unidentified metal cross (Grasse 2005). Lee's hypothesis, particularly in light of this recent work, offers one possible explanation for the unique colors at Pleito. At the conclusion of her paper (1979:303), Lee made a call to "resolve this interesting and important riddle" and explain why such unique pigments occur at this particular site. After 30 years, and largely due to some of the recent discoveries outlined below, that call is addressed here. The present paper outlines an experiment in which raw minerals sampled from a recently discovered quarry found near Pleito were processed to see if an alternate, perhaps simpler, explanation could be found for the presence of these rare blue and green pigments at this exceptional rock art site

PIGMENTS AND THE PICTOGRAPHS OF PLEITO

The Chumash of south-central California are well known for the numerous pictographs they left behind (Grant 1965). Their compelling rock paintings have attracted a number of laboratory-based scientific studies focused upon the red, black, and white pigments used and their binding agents (Bishop and Derrick 1994; Erlandson et al. 1999; Scott and Hyder 1993; Scott et al. 1994); other studies have delved into the wider social meanings behind the use of pigments, drawing particularly upon ethnographic or ethnohistorical data (Campbell 2007; Robinson 2004). The majority of Chumash pictographs consist of monochrome, single elements that are rarely superimposed over one another (Hudson and Lee 1981; Lee 1984). However, the Chumash are most renowned for less frequent, yet exceptional, polychrome pictographs that are often arranged in beguiling compositional 'set pieces' (Robinson 2006:248–249). The most typical Chumash polychrome palette is made up of four colors: red, black, white, and yellow, with red being the most dominant color used. However, the Pleito site has the most varied color palette of any known rock art site in California—it is the only known site in California to have true blue, green, and orange pigments combined in the rock art, in addition to all of the more common colors (Reeves et al. Pl. 1). In fact, it is one of the most spectacular pictograph sites in the country, and is considered by some to be the "finest example of prehistoric rock art in the United States" (Grant 1978:534). The greens range in color from a light jade to a dark terra verde. The pigment is thick and opaque. Green is present in six distinct elements, as well as in traces in several other locations. The blues range from a rich turquoise, to a robin's egg blue, to an 'optical blue' (discussed below). The blue appears in eight elements, with traces in two panels. The orange is a true orange in hue.

During the documentation of this site from 1999 to 2003 (see Bury et al. 2003), several avenues of research were explored to learn more about the makeup of these pigments. An analysis of one recovered pigment fragment from the floor of the cave found no trace of mission-derived pigments. In fact, the 'blue' was found to be made up of separate black and white glazes that together created an 'optical illusion' of blue gray, an effect known as 'optical blue' (Scott et al. 2002; see also Campbell 2007 for a discussion of optical blue at Pleito and experiments to recreate it). Another exfoliated sample of blue/green pigment was also recovered and was determined to contain the mineral malachite (Watchmen 1999). While the 'optical blue' effect does account for the lighter shade of blue, it does not account for the turquoise blues or the range of greens used at this site. Nor does it account for the high levels of opacity.

During the course of documenting the site, a small quarry containing a vein of hydrous copper was identified several air miles away. In the maw of the quarry, blue and green mineral seams are visible to the eye. The quarry is of indeterminate age, since no artifacts have been found on the surface. The seams contain a poor grade

of malachite and azurite (Watchman 1999), and it seems possible that some of the blue and green pigments at Pleito could have come from this quarry site.

EXPERIMENTAL PROCESSING OF PIGMENTS

As Cunningham et al. (2008:v) argue, an archaeological experiment must "answer a specific research question." Indeed, the recent literature in experimental archaeology emphasizes the need for clearly stated aims, repeatability in design, and a direct relationship between the experiment and the archaeological record (Cunningham et al. 2008; Outram 2008; Reynolds 1999). Since it seemed possible that the minerals found at the quarry could have been utilized for the making of the 'exotic' pigments used in the rock art at Pleito, we decided to perform an experiment in pigment processing to test whether or not the colors found at Pleito could be reproduced using those minerals.

Procedure

Samples of the minerals were obtained from the quarry (Fig. 2) for the experiment. The ore was broken up into small pieces in a sandstone mortar and then decanted with water to remove the softer matrix (see Reeves et al. Pl. 2 for process). The remaining pieces were high graded into blues and greens. The pieces of each color were then ground up separately in a mortar to a fine powder. (The processing of these materials was very time consuming.)

To produce colors matching those in the cave, powders made from these ground minerals were then mixed with water and a locally obtainable binder, the seeds of the wild cucumber (*Marah macrocarpa*). It is known that these seeds were used as a paint binder for body painting by some indigenous California tribes (Bishop and Derrick 1994), and wild cucumber plants have been found a couple of hundred meters away from the Pleito site. The mixture, made with a ratio of two parts of pigment to one part of seed, proved to have excellent binding qualities, being color fasting and water resistant.

An additional experiment was undertaken with commonly obtainable yellow ochre that is found easily in the bioturbated soils near Pleito. Heat treatment successfully altered the color to an orange matching that at Pleito.

Figure 2: Dan Reeves obtaining samples from quarry site.

These experimental pigments were next applied to a sandstone slab (Reeves et al. Pl. 3). Every shade of the blues and greens found in the pictographs could be reproduced in these experiments with a high level of opacity. It therefore is confirmed that the 'exotic' blues and greens found at Pleito could have been derived from local quarry sources, while the oranges could be produced through heat treatment of readily available yellow ochre.

BLUE AND GREEN PIGMENT IN SOUTH-CENTRAL CALIFORNIA AND NEIGHBORING REGIONS

Unlike many other Chumash sites, Pleito has extensive superimposition in many panels (see Bury et al. 2003); in fact, six layers of painting are evident in most of the panels found at Pleito. Traces of green and blue were found in layers beneath the dominant painting events; combined with the experiment outlined above, this suggests that rather than being imported from the missions in late historical contexts, the knowledge and use of these colors was local and likely of some antiquity. The ethnohistorical and archaeological literature was examined in conjunction with the pigment experimentation to see if there was any evidence for the indigenous use of exotic pigments either locally or in wider south-central California contexts.

Blue

The significance of blue pigments to the Emigdianos is confirmed by a southern Yokuts myth, adapted from an

Emigdiano myth, that was recorded by A.L. Kroeber (Kroeber 1907a:240-242). In the myth (after a protracted series of events), Prairie Falcon drowns and Coyote puts "blue rock paint on falcon as medicine and made him well again" (1907a:242). This suggests that special qualities were attributed to a processed 'blue rock' mineral by the Emigdianos, particularly in relationship to healing. The preparation of the blue and green minerals in our experiment was notably labor intensive in comparison with the preparation of the softer and more common ochre. This implies a high degree of attention, even specialization, had to be devoted to these special pigments, a fact reiterated by Scott et al. 2002 in their analysis of exfoliated pieces from Pleito; they noted the extra processing that was required to produce the small particle size of the pigments as well as the high level of skill needed to produce the optical blue (see also Campbell's 2007 account of the difficulties encountered in replicating optical blue). It is interesting that the Prairie Falcon blue-rock myth was narrated by a consultant named Chalola (Kroeber 1907a). Chalola was of mixed ancestry (Kroeber 1907b:69), probably half Yokuts and half Chumash, and was perhaps related to Raphael Solares, a well-known Chumash leader and consultant for León de Cessac (see Hudson and Blackburn 1978:247). Chalola was also a dancer, and he is said to have provided *'ayip*, a strong 'medicine' made from minerals (and other substances) to one of Harrington's consultants. Both Kroeber and C. Hart Merriam interviewed Chalola between 1900 and 1906 (Kroeber 1907a:169; Merriam 1955:77). It is noteworthy that he was born and raised on the Tejon Indian Reservation, which is only a few miles from Pleito (Kroeber 1907b:69). Merriam documented a mourning ceremony at Fort Tejon in which a solo dancer performed in "red, white, blue, and gray" paint, "each color having a special significance" (Merriam 1955:83).

Blue is seen at other south-central Californian rock art sites, though rarely. A trace can be seen at La Cueva Pintada in Salinan territory (see Campbell 2007:47), a blue element is documented at SBA-1652 in the San Marcos Pass (Hyder 2002:33), another at SBA-501 in the Sierra Madre (Horne and Glassow 1974:61), in two small elements at Selby on the Carrizo Plain (Campbell 2007:52-53), and another possibly at Rocky Hill in Yokuts territory (Campbell 2007:58). Certainly no site has as much blue or is nearly as elaborate as Pleito. Just as it is rare in rock art, blue pigment is also rare as a body embellishment, but there are a smattering of south-central California ethnohistorical accounts documenting such a use. In A.D. 1602, Father Antonio de la Ascensión recorded the use of a blue body pigment on Santa Catalina Island, and again on Santa Barbara Island: "The black paint, or rather blue paint, appeared to be silvered, and on being asked by signs of what it was made, they displayed some stones of metal of London blue, from which they made it" (in Wagner 1929:234). The source was interpreted as being the inland area of the mainland, but Father Ascensión took this to mean that the pigments were of Spanish origin, which seems unlikely. Fages likewise documented the use of "blue paint clays" by the Santa Barbara mainland Chumash (in King 1982:463). A sample of blue pigment from a Chumash grave near Avila (the "first known occurrence of blue paint as a burial accompaniment" [Pilling 1952:171]), excavated by the Rev. Robert W. Summers in the 1880s, was analyzed by the British Museum and found to be azurite (see Campbell 2007:44). Pilling (1951:197) reported a painted stone slab with "blue wash" from SLO-2 (Port San Luis).

In looking at Sierran and Great Basin contexts, the Northern Miwok are said to have used "blue and yellow minerals" (Sherwin 1963:86), while the Northern Paiute of Surprise Valley were documented as infrequently using a dark blue pigment, one perhaps close to black in color (1963:90). Yokuts tattooing employed charcoal, casting a "dark blue-grey" hue (Gayton 1948a:70), and the Monache traded "blue paint" to the Yokuts (1948a:160). The Mono also had a dark blue paint called *wa 'wina*, "a paint like soft rock" (1948b:265), while Latta (1999:299) said he witnessed the quarrying of a crude form of graphite which looked "heavy blue-black" and was called *kódeen* by the Yokuts. A "bluish-white…roughly shaped chunk of steatite" thought to have been used for pigment was found in excavations at the Esselen rock art site of Meadows Cave (Meighan 1955:20).

Emigdiano Blue

The above accounts indicate an infrequent but widespread use of dark, 'bluish-black' pigments. It is important to note that a blue-black variant called *k' aljan* was said to be an "earth" obtained north-east of "San Emigdio Potrero Mountain" and was thought to be accessible up "San Emigdio Creek." It was used as a face-paint for women,

was said to be applied by Yokuts dancer and shaman Bob Batista on the body, and was used medicinally by giving it to "a baby when sick" in minute amounts mixed in hot water (Gorden 1996:39-48; see Harrington 1985:Pt.2, R.1.89. Fr.1358, Pt.2, R.1.89, Fr.1260). This Emigdiano blue color was variously described as "violet," similar to "blue agate dish ware but darker," "more or less blue," or similar to the lead in a pencil (Harrington 1985:Pt.2, R.1.89. Fr.1358, Pt.2, R.1.89, Fr.1260). Thomas and Maria Wheaton told J.P. Harrington that "*k' aljan* was placed in water, stirred, and allowed to settle. The fine matter on the surface of the water was the portion which was used" (Gorden 1996:48), while other accounts say that it may have been burnt to turn it bluish-black like writing ink (Harrington 1985:Pt.2, R.1.89, Fr.1358). The consultants do not seem to have visited the source of the pigment, so it may be that they only saw the processed product and not the raw material, which perhaps explains the variety of shades described. It is possible that the material was processed differently to create different hues, or even that more than one local source existed. However, the quarry site found and sampled by us is located remarkably close to the area mentioned in both of the ethnographic accounts recorded by Harrington.

Green

Information on green pigments is even scarcer. An oval rock found in an historic-period-bundle in Big Dog Cave on San Clemente Island appeared to have green paint on it (McKusick and Warren 1959:132), while the Achomawi were said to trade green to the Northeastern Maidu (Sherwin 1963:93). Gayton (1948b:162) recorded an account of green being brought by the Paiute into the region of the Sierra Mono during the Ghost Dance events of the 1870s. Numerous green pictographs are found at the Horse Canyon site (CA-KER-93) in the Tehachapi Mountains, and others have been recorded at the more distant Newberry Cave in the Mohave Desert (see Campbell 2007:46). Some accounts have difficulty differentiating between blue and green. Eleven pieces of a 'blue-green' fuchsite, some with abraded facets indicating processing, were found in the Medea creek excavations, and were said to produce a "light silvery blue-green powder" (King 1982:461). Campbell (2007:47) discusses green pigments used by the Fernandeño that were quarried from a small hill near Hueneme wharf.

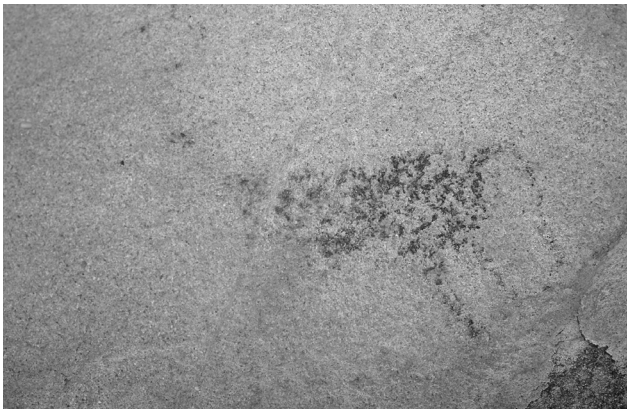

Figure 3. Black charcoal quadruped, Pleito (CA-KER-77).

When specified, almost every reference to blue or green pigment refers to it as "face paint," typically used as "medicine." Ethnohistoric research indicates that during historic times, various types of blues and greens were quarried, traded, mixed, and applied as part of traditional indigenous practices across south-central California. It is important to note that 'blue-rock paint' was associated with the Emigdiano in their mythology and was used locally, and that a mineral quarry for a blue-black pigment was known to exist northeast of San Emigdio Mountain, likely within Emigdiano territory.

INVOKING OCCAM'S RAZOR

At Pleito, it is evident that the traditional practices mentioned in ethnohistorical sources were reflected in—but ultimately surpassed by—the efflorescence of spectacular art found at this Emigdiano site. However, hardly noticeable and almost overwhelmed by the vibrancy of these paintings, there is a directly applied charcoal-black linear motif that occupies exfoliated surfaces. One element found on the exfoliated, friable surface at the back of the shelter depicts a quadruped; it is shown in side view (Fig. 3), while all other zoomorphic or anthropomorphic images identified in the area are shown frontally (Robinson 2006). Given the fact that the apparent quadrupedal element is rendered in charcoal on an exfoliated surface, and that it is suggestive of a horse or cow, this episode of rock art expression is placed within the historic period. At other local rock art sites, black-linear elements are discretely applied away from other art—as at Lizard Cave and Salt—or is superimposed over earlier art—as at Los Lobos and

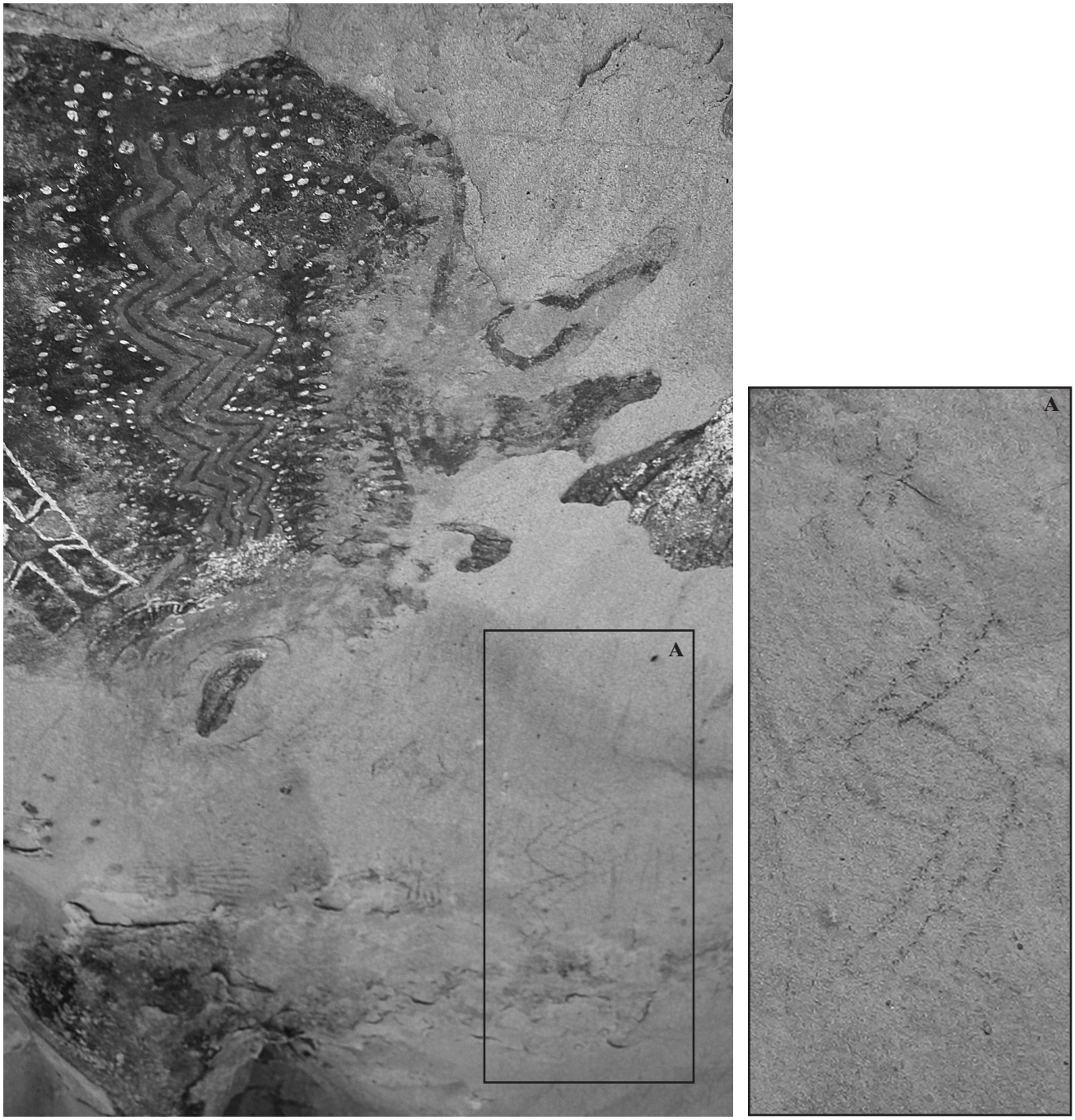

Figure 4. Black charcoal linear element (A) appearing to mimic earlier polychrome element (Pleito, CA-KER-77).

Three Springs (see Robinson 2006). At Pleito, some of this black-linear art, such as a zigzag element, appears to mimic earlier polychrome shapes containing green pigment (Fig. 4). To confuse matters further, however, some black-charcoal paintings appear within earlier sequences, while in other Chumash areas, black-linear seems to be the earliest in the sequence (see Hyder 1989, 2002). However, in the case of most Emigdiano sequences, the earlier black layers are usually finger-applied rather than charcoal drawn; this evidence indicates that the final phase of painting occurring in Emigdiano territory was the directly-applied, black-linear, rather then the polychrome panels containing exotic colors.

We think the simplest explanation for all of this is that the exotic pigments found at Plieto were from local rather than distant sources, and date from before 1824. In addition, the final phase monochrome black designs are the most likely candidates for post-contact pictograph making, not the polychrome. The application of this hypothesized later art was simple and expedient—all that was needed was a fresh charcoal stick. The polychrome pigments required careful preparation in order to achieve fine grain consistency and proper color balance. This suggests a well established knowledge of local sources, a well-developed understanding of methods of processing, and an undisturbed context within which to practice those methods. It is likely that the fragmentation of indigenous society during the historical period included a fragmentation in this tradition of artistic craftsmanship—the quarrying, trading, mixing, and painting of pigments.

CONCLUSIONS

Several lines of evidence indicate that the 'exotic' colors found at Pleito were derived from local sources rather than stemming from the 1824 mission revolt. The replication of color and opacity from local sources (quarry and local soils) provides a simpler alternative than evoking the complicated series of events of the 1824 revolt (i.e., retrieving pigments from mission stores, flight, and resettlement). While blue pigments do appear to have been used in historic times, especially on the body, regional ethnography indicates that there was a knowledge of readily available local sources, that blue pigments were present in local mythology, and that blue pigment was used as a medicine.

However, the occupation of the Emigdiano landscape and even at Pleito itself during historical times has been unequivocally demonstrated by recent archaeological research. While the principle of parsimony ultimately argues against an acquisition of exotic pigments from the missions, it advances a new hypothesis suggesting that historical rock art was produced in the form of expedient, monochrome charcoal-black pictographs. Like Georgia Lee's suggestion of 30 years ago, our new hypothesis requires additional research if we are to accept that rock-art was produced in mission and/or post-mission times. Future research involving such techniques as the direct absolute dating of the charcoal pictographs may help to confirm or reject their apparently recent production. Additionally, excavating the quarry site may help to identify the period(s) of quarrying activity, thus perhaps bracketing the possible period of blue and green pictograph making at Pleito.

Lee's original research usefully put forward the call to look very closely at the exceptional palette of colors seen at Pleito (Reeves et al. Pl. 4). We follow her lead in proposing a new hypothesis based upon the more humble rock art seen in the final monochrome phases. Which of these hypotheses is most likely remains open to inquiry. Certainly the idea that some of the unusual pigments at Pleito could have been brought from the missions, or that some of the polychrome painting may date to the early historic period can not be ruled out. No definitive evidence yet exists. However, the quantity of paint used in this cave, the layering of superimposed painting, the traditional preparation and use of exotic pigments in body paint, and the availability from a local source, all argue that these unique colors were manufactured in the Emigdiano area: the simplest answer is that the local art was made by local people using local materials.

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REFERENCES

Bancroft, Hubert Howe
1966 *The Works of Hubert Howe Bancroft Volume XIX: History of California. Vol. II. 1801–1824*. San Francisco: The History Company.

Bernard, Julienne
2008 *Resistance, Persistence and Culture Change at a Historic Period Inland Chumash Village*. Ph.D. dissertation, University of California, Los Angeles

Bishop, M., and M. Derrick.
1994 The Use of Wild Cucumber Seeds (*Marah macrocarpus*) in California Rock Art. Paper read at the Western Association for Art Conservation Meeting 1994.

Boyd, C. Clifford
2004 Monacans as Moundbuilders? *American Antiquity* 69:361–363.

Bury, Rick, Antoinette Padgett, and Dan Reeves
2003 *The Pleito Project. Documentation of CA-KER-77 Rock Art*. MS on file at the The Wildlands Conservancy, Oak Glen, California.

Campbell, Paul Douglas
2007 *Earth Pigments and Paint of the California Indians: Meaning and Technology*. La Cresenta: Paul Campbell.

Castillo, Edward D.
1999 Blood Came from Their Mouths: Tongva and Chumash Responses to the Pandemic of 1801. *American Indian Culture and Research Journal* 23(3):47–61.

Cook, Sherburne F.
1962 Expeditions to the Interior of California: Central Valley, 1820–1840. *University of California Anthropological Records* 20(5):151–213. Berkeley: University of California Press.

Cunningham, P., J. Heeb, and R. Paardekooper
2008 Introduction. In *Experiencing Archaeology by Experimen*t, P. Cunningham, J. Heeb, and R. Paardekooper, eds., pp. v–ix. Oxford: Oxbow.

Dunham, Gary H., Debra L. Gold, and Jeffrey L. Hantman
2003 Collective Burial in Late Prehistoric Virginia: Excavations and Analysis of the Rapidan Mound. *American Antiquity* 68:109–128.

Erlandson, Jon M., J. D. Robertson, and Christopher Descantes
1999 Geochemical Analysis of Eight Red Ochres from Western North America. *American Antiquity* 64(3):517–526.

Gayton, A. H.
1948a Yokuts and Western Mono Ethnography: I: Tulare Lake, Southern Valley, and Central Foothill Yokuts. *Anthropological Records*, 10(1). Berkeley: University of California Press.
1948b Yokuts and Western Mono Ethnography: II: Northern Foothill Yokuts and Western Mono. *Anthropological Records*, 10(2). Berkeley: University of California Press.

Gorden, M.
1996 An Ethnographic Compilation of the Sources, Composition, and Uses of Paints by the Yokuts of the Southern San Joaquin Valley and Sierra Nevada, California. *Kern County Archaeological Society Journal* 7:36–58.

Grant, Campbell
1965 *The Rock Paintings of the Chumash*. Berkeley: University of California.
1978 Interior Chumash. In *Handbook of North American Indians, Vol. 8, California*, Robert F. Heizer, ed., pp. 530–534. Washington, D.C.: Smithsonian Institution.

Grasse, Gale
2005 The Pleito Puzzle: An interim report on the excavations at CA-KER-77, Bakersfield, CA. Paper read at the annual meeting of Society for California Archaeology, Sacramento, California. 2006

Harrington, John P.
1985 *John P. Harrington Papers, Vol. 2: Northern and Central California*. Washington: Smithsonian Institution, National Anthropological Archives. [Microfilm edition. Millwood, NY: Kraus International Publications.]

Hantman, Jeffrey L., Debra L. Gold, and Gary H. Dunham
2004 Of Parsimony and Archaeological Histories: A Response to Comment by Boyd. *American Antiquity* 69(3):583–585

Horne, Stephen P., and Michael Glassow
1974 *Archeological Investigations, Sierra Madre Ridge, Los Padres National Forest*. MS on file at the Los Padres National Forest.

Hudson, Travis, and T. C. Blackburn
1978 The Integration of Myth and Ritual in South-Central California: The "Northern Complex." *Journal of California Anthropology* 5(2):225–248.

Hudson, Travis, and Georgia Lee
1981 Function and Purpose of Chumash Rock Art. *Masterkey* 55(3):92–100.

Hyder, William D.
1989 Rock Art and Archaeology in Santa Barbara County, California. *Occasional Papers* 13. San Luis Obispo, Calif.: San Luis Obispo County Archaeological Society.
2002 *Rock Art of the San Marcos Pass, Santa Barbara County, California*. Scotts Valley, California: Datura Press.

King, Linda B.
1982 *Medea Creek Cemetery: Late Inland Chumash Patterns of Social Organization, Exchange and Warfare. Volume 2*. Ph.D. dissertation, University of California, Santa Barbara.

Kroeber, Alfred L.
1907a Indian Myths of South Central California. *American Archaeology and Ethnology* 4(4):167–250. Berkeley.
1907b Shoshonean Dialects of California. *American Archaeology and Ethnology* 4(3):65–166. Berkeley.

Latta, Frank
1976 *The Saga of Rancho El Tejon*. Santa Cruz: Bear State Books.
1999 *Handbook of the Yokuts Indians*. Exeter, California: Brewer's Historical Press.

Lee, Georgia
1979 The San Emigdio rock art site. *Journal of California and Great Basin Anthropology* 1(2):295–305.

1984 Rock Art of the Sierra Madre Ridge. In *Papers on Chumash Rock Art*, pp. 11–46. *Occasional Papers* 12: San Luis Obispo, California: San Luis Obispo County Archaeological Society.

McKusick, Marshall B., and Claude N. Warren
1959 Introduction to San Clemente Island Archaeology. *Annual Reports of the Archaeological Survey* 1:106–183.

Meighan, Clement W.
1955 Excavation of Isabella Meadows Cave, Monterey County, California. *Reports of the University of California Archaeological Survey* 29(30):1–30.

Merriam, C. Hart
1955 *Studies in California Indians*. Berkeley & Los Angeles: University of California Press.

Morgan, W. H.
1914 *History of Kern County, California*. Los Angeles: Historic Record Company.

Outram, Alan K.
2008 Introduction to Experimental Archaeology. *World Archaeology* 40(1):1–6.

Pilling, Arnold R.
1951 The Surface Archeology of the Pecho Coast, San Luis Obispo County, California. *Masterkey* 25(6):196–200.

1952 The British Museum Collection from near Avila, California. *American Antiquity* (18)2:169–172.

Reynolds, P. J.
1999 The Nature of Experiment in Archaeology. In *Experiment and Design*, A. F. Harding, ed., pp. 156–162. Oxford: Oxbow.

Robinson. David W.
2004 The Mirror of the Sun: Surface, Mineral Applications, and Interface in California Rock Art. In *Soils, Stones and Symbols: Archaeological and Anthropological Perspectives on the Mineral World*, Nicole Boivin and Mary Ann Owoc, eds., pp 91–106. London: University College London Press.

2006 *Landscape, Taskscape, and Indigenous Perception: The Rock-art of South-Central California*. Ph.D. dissertation, University of Cambridge, United Kingdom.

Robinson, David W., and Fraser Sturt.
2008 Towards Articulating Rock-art with Archaeology: An Interim Report of the Pinwheel Cave Rock-art and Bedrock Mortar Complex (KER 5836 & 5837), Kern Country, California. *Kern County Archaeological Society Journal* 10:25–44.

Rodriguez-Fernández, José Luis.
1999 Okham's Razor. *Endeavour* 23(3):121–125.

Sandos, James A.
1985 Levantamiento! The 1824 Chumash Uprising Reconsidered. In *American Encounters: Natives and Newcomers from European Contact to Indian Removal—1500–1850*, Peter C. Mancall and James H. Merrell, eds., pp. 506–525. New York, London: Routledge.

Scott, David A., and William D. Hyder
1993 A Study of Some Californian Indian Rock Art Pigments. *Studies in Conservation* 38(3):155–173.

Scott, David A., M. Newman, M. Schilling, M. Derrick, and H. P. Khanjian.
1994 Blood as a Binding Medium in a Chumash Indian Pigment Cake. *Archaeometry* 38(1):103–112.

Scott, David A., Stefanie Scheerer, and Daniel J. Reeves
2002 Technical Examination of Some Rock Art Pigments and Encrustations from the Chumash Indian Site of San Emigdio, California. *Studies in Conservation* 47(3):184–194.

Sherwin, Janet
1963 Face and Body Painting Practices among California Indians. *Reports of the University of California Archaeological Survey* 60:80–147.

Stickle, G., and A. Cooper
1969 The Chumash Revolt of 1824: A Case for an Archaeological Application of Feedback Theory. *University of California Archaeological Survey Annual Reports* 11:5–21. Los Angeles.

Wagner, Henry R.
1929 *Spanish Voyages to the Northwest Coast of America in the Sixteenth Century*. San Francisco: California Historical Society.

Watchman, Alan
1999 *A Report on Mineral Samples from Wind Wolves Preserve and Rock Art Fragments from the Locus 1, Cave 1 at CA-KER-77.* MS on file at the The Wildlands Conservancy. Oak Glen, California.