Rock art chronology in eastern California

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Archaeological sites containing or composed of rock engravings and paintings constitute one of the more common categories of aboriginal remains in western North America. Although relatively common, only rarely are they afforded serious consideration by Americanist prehistorians, even though substantial inroads have been made in the study of prehistoric parietal art, and the application of information derived therefrom to larger archaeological problems, in other portions of the world (e.g. Lewis-Williams 1981). At least in part, western North American rock art has suffered the ignominy of relegation to graphic art for report and monograph covers, without incorporation into culture histories and syntheses, because of an absence of chronological control. Lacking any firm notion of temporal placement, North Americanists have had little option but to view rock art as interesting artistically but of only anecdotal value in prehistoric reconstructions and explanations.

Recent advances in the ability to obtain chronometric and relative dates from rock varnish found covering many lithic surfaces in arid regions have allowed us to obtain temporal assignments for rock engravings from the California Desert, southern Great Basin, North America (Fig. 1). We present 13 absolute chronometric dates, obtained by cation-ratio dating, from the Cima volcanic region, and an additional date from the Coso Range, where our earlier rock art dating work was focussed. These and previously published dates, along with a consideration of other lines of evidence, allow us to reassess the rock engraving chronology for eastern California, and to postulate a petroglyph tradition starting in the late-Pleistocene and continuing into the Historic period.

Rock art chronologies in eastern California

Speculation concerning the antiquity of rock art in eastern California started with the earliest visitors' accounts of the region during the mid-19th century. In common with many antiquarian writings from that century, the rock art was postulated to have dated from an unknown prehistoric period, due to a prevailing view that the ethnographic inhabitants of the region were incapable of producing the engravings and paintings observed by travelers (cf. Farley quoted in Chalfant 1933: 130). Such speculation would
Figure 1 Location of the Cima Volcanic field and the Coso Range regions within eastern California, North America.

remain incidental to the history of Great Basin archaeological research, were it not for the persistence of this notion in the recent writings of a number of Great Basin scholars. Initiation of modern attempts at age estimation and construction of chronologies can be attributed to Julian Steward (1929), who provided the first significant study of rock art in this area. Steward’s initial approach was the intuitive definition of motif ‘styles’, and an impressionistic examination of the relative superpositioning of one style above another, to develop a relative chronology. Although Steward’s method was intuitive, the relative chronology and the styles that he defined (Curvilinear, Rectilinear and Representational) have remained intact (cf. Dorn and Whitley 1984). Steward is, of course, well-known as the consummate Great Basin ethnographer; hence his statements concerning rock art chronology in the Historic period have gone unquestioned. Writing as recently as 1968, Steward found no reason to assume that Historic (aboriginal) Basin groups had anything to do with the creation of the rock art of the region. He therefore argued that the engravings and paintings represent a prehistoric phenomenon of indeterminate antiquity.

More specific rock art chronologies were provided by Heizer and Baumhoff (1962), and Grant (1968). Heizer and Baumhoff posited absolute ranges of 1000 B.C. to A.D. 1500, A.D. 1 to 1500, and A.D.1 to 1500 for the Great Basin Curvilinear Abstract, Rectilinear Abstract, and Representational styles respectively. Grant, addressing the
Coso Range area only, argued for a tripartite chronological scheme of early, middle and late periods with absolute time spans of 1000 to 200 B.C., 200 B.C. to A.D. 300, and A.D. 300 to 1000. Both estimates were based on a variety of assumptions that were either unsupported, or have been disproven with later experimentation (Dorn and Whitley 1984). Salient aspects of the two temporal schemes are the continued support for the Steward relative stylistic chronology, and the hypothesized truncation of petroglyph manufacture prior to the Historic period (starting at A.D. 1772); i.e., the continued belief that all engravings are by definition prehistoric in age, due to the apparent absence of ethnographic mention of their manufacture.

Cation-ratio dating and absolute rock engraving chronology

Recent research by Dorn (1983) has shown that the rock varnish (sometimes referred to as ‘patina’ or ‘desert varnish’), found as an ubiquitous coating on rock surfaces in arid regions, can be used to obtain absolute chronometric and relative dates. The age determination technique, cation-ratio dating, is based on the relative mobility versus relative immobility of the different chemical constituents of rock varnish. The more mobile cations, such as potassium and calcium, are leached out of rock varnish at a faster rate than those that are less mobile, such as titanium. Over time the ratio of K + Ca: Ti should be reduced, at a rate that varies regionally.

Although simple K + Ca: Ti ratios can be compared within a given region for relative temporal placement, establishment of chronometric dates necessitates the definition of a regional calibration, or cation leaching curve. Such leaching curves are based on the correlation of cation-ratio values and radiometric dates obtained from the same geomorphological surfaces. Currently there are three means of establishing calibration points: (1) use of K-Ar dated basalt flows, providing calibration points for the late-Pleistocene and earlier, therefore of limited utility to problems of Holocene archaeology; (2) use of tandem accelerator-mass spectrometer (TAMS) C14 dates on varnish on Holocene landforms such as desert pavements, thereby allowing for definition of the calibration curve in the Holocene; and (3) use of man-made surfaces of known antiquity, providing points on the leaching curve in the very recent past.

As of 1986 two regional calibrations have been defined and used in archaeological applications. The first established a leaching curve for the Coso Range region, based on the following calibration points: 12 K-Ar dated basalt flows, ranging in age from 39,000 to more than 3 million years B.P.; varnish at the 10,500 years B.P. high shoreline of Searles Lake; and the cation-ratio for the < 2μ fraction of surficial soil, indicative of modern cation-ratio values (Dorn 1983; Dorn and Whitley 1983, 1984). The second calibration (Fig. 2), for the central Mojave Desert, is based on six Late Pleistocene/Holocene TAMS C14 dates on varnish on landforms, with ages ranging from 1,370 ± 360 (AA-938) to 16,800 ± 700 (AA-670) years B.P.; three K-Ar dated late-Pleistocene basalt flows; the desert pavement of the high shoreline of Lake Mohave dated between 10,000 and 15,500 years B.P.; and the < 2μ fraction of surficial soil in the region, representing the modern cation-ratio (Dorn et al 1986).

Initial petroglyph studies using cation-ratio dating resulted in the establishment of five
Figure 2 Varnish cation-leaching curve for the Mojave River Basin, eastern California. The cation-ratio used is K + Ca : Ti. Each ratio represents the average of at least 5 Particle Induced X-Ray Emission analyses of varnish from that calibration site; \( h_1 \), \( i_1 \), and \( i_2 \) represent K-Ar dated basalt flows in the Cima volcanic field. LM represents the ca. 12,500 year old high stand of Lake Mohave. MS is the less than 2 micron fraction of Mojave aeolian deposits, representing the initial varnish cation-ratio. The remaining calibration points are correlations of cation-ratios and varnish-radiocarbon ages. Horizontal bars represent age-uncertainties and vertical bars standard deviations of varnish cation-ratios. The line is a semi-log least-squares regression that indicates the probable rate of cation-leaching in the Mojave River Basin. The line can also be described by the equation:

\[
Y = 12.71 - 2.07 \log_{10} X
\]

where \( Y \) is the \( K + Ca : Ti \) ratio and \( X \) is years B.P.

dates on Coso Range petroglyphs, ranging from 6,400 years B.P. (ca. 4,450 B.C.) to 580 years B.P. (ca. A.D. 1,370). At the Grimes Point site in Central Nevada cation-ratios provided provisional support for the stylistic chronology for the Great Basin, proposed by Heizer and Baumhoff, and relative cation-ratio analyses identified temporal variability between certain geometric and representational elements of the Gila Petroglyph style from central Arizona (Dorn and Whitley 1984). Although only five absolute dates were then obtained, and these included substantial error margins, they are indicative of a tradition of petroglyph production twice as long as that previously hypothesized for the region. The youngest dated motif, a representaional engraving of a
bighorn sheep, also suggested a continuation of rock engraving beyond Grant's (1968) hypothesized termination at A.D. 1000.

**Cation-ratio dating rock engravings in the Cima volcanic field**

Following the establishment of a calibration curve for the central Mojave Desert, thirteen petroglyphs were sampled from site CA-San Bernardino-1884a and b (Aiken Wash), within the Cima volcanic field, San Bernardino County, California (Fig. 3). Samples were obtained from within the pecked-out areas of the engravings using a tungsten carbide needle for scraping, and under 8.75× magnification. Varnish samples were cleaned of particles from the underlying rock under 45× stereomagnification in the lab. Samples were prepared for chemical analysis by Particle-Induced X-ray Emissions (PIXE) analysis, as discussed by Dorn (1983) and Dorn and Whitley (1984). The engraving site consists of a basalt flow forming the northwestern boundary of a dry wash, with the petroglyphs pecked along this basalt face. CA-San Bernardino 1884a, which we have designated sampling locale Cima-1, contains about 100 petroglyphs. They are positioned on basalt boulders on the outside of a stone arch, formed by a partially collapsed cave ceiling. Within this stone arch three small panels of rock paintings are also present. CA-San Bernardino-1884b, sampling locale Cima-2, is located approximately 100 meters northwest of Cima-1, and contains about 250 petroglyphs.

![Figure 3](image.png)

*Figure 3* Location of Cima-1 and Cima-2 (CA-SBr-1884a and b), within the Cima volcanic field, San Bernardino County, California. Contour intervals are 100 feet; grid coordinates are Universal Transverse Mercator 614000 m Easting and 3901000 m Northing.

These rock engravings are all representative of the Great Basin Curvilinear Abstract or Rectilinear Abstract styles as defined by Heizer and Baumhoff (1962). At this site and at other sites examined in the region (CA-San Bernardino–1838–1846) no clearly Representational style elements were observed, although a few motifs were observed that conceivably (but only arguably) could be classified to this style. The so-called Great
Basin Scratched style was also present at the site, but was not dated due to an absence of revarnishing within petroglyphs of this style.

Cation-ratio dates for these thirteen rock engravings are presented in Table 1. The range of these dates extends from 10,800 ± 800 years B.P. to 200 ± 50 years B.P., or from the Pleistocene/Holocene transition to the Historic period for this region. These dates are based on the cation-leaching curve for the central Mojave Desert (Fig. 2). The curve is discussed in detail by Dorn et al (1986). A cation-ratio date (and error margin) is based on the average cation-ratio (and standard error) on PIXE analyses of multiple varnish samples (Dorn 1983). For example, three PIXE analyses of petroglyph Cima 2–5 yield a mean cation-ratio of 4.35 for a date of 10,800 years B.P. The upper standard error (4.41) yields an age of 10,100 years B.P. and the lower standard error (4.29) an age of 11,600 B.P. The calculated date is 10,800 ± 800 years B.P. Error margins for the thirteen dates average 16.7%.

Of greatest immediate interest in this series of dates is the Late Pleistocene age of 10,800 ± 800 years B.P. for engraving Cima 2–5 (Fig. 4). This motif is a Curvilinear Abstract element, classified by Heizer and Baumhoff (1962) as a ‘snake’ design, although we do not feel this attribution sufficient to imply Representational status for the

Table 1 Cation-ratio dates on rock engravings from the Cima volcanic field and Coso Range, California

<table>
<thead>
<tr>
<th>Sampling locale Cima-1</th>
<th>Cation-ratio date</th>
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<tr>
<td>Sample</td>
<td></td>
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<tr>
<td>1-1</td>
<td>2,150 ± 200</td>
<td>Curvilinear Abstract</td>
</tr>
<tr>
<td>1-2</td>
<td>7,600 ± 1,800</td>
<td>Curvilinear Abstract</td>
</tr>
<tr>
<td>1-3</td>
<td>4,750 ± 150</td>
<td>Rectilinear Abstract</td>
</tr>
<tr>
<td>1-4</td>
<td>275 ± 50</td>
<td>Curvilinear Abstract</td>
</tr>
<tr>
<td>1-5</td>
<td>200 ± 50</td>
<td>Rectilinear Abstract</td>
</tr>
<tr>
<td>1-6</td>
<td>2,750 ± 200</td>
<td>Curvilinear Abstract</td>
</tr>
<tr>
<td>1-7</td>
<td>950 ± 150</td>
<td>Rectilinear Abstract (?)</td>
</tr>
<tr>
<td>1-8</td>
<td>525 ± 75</td>
<td>Curvilinear Abstract</td>
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<td>Sample</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-1</td>
<td>3,850 ± 100</td>
<td>Curvilinear Abstract</td>
</tr>
<tr>
<td>2-2</td>
<td>2,000 ± 150</td>
<td>Curvilinear Abstract</td>
</tr>
<tr>
<td>2-3</td>
<td>1,775 ± 50</td>
<td>Curvilinear Abstract</td>
</tr>
<tr>
<td>2-4</td>
<td>335 ± 50</td>
<td>Rectilinear Abstract</td>
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<tr>
<td>2-5</td>
<td>10,800 ± 800</td>
<td>Curvilinear abstract</td>
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<table>
<thead>
<tr>
<th>Sampling locale Coso BSS-3</th>
<th>Cation-ratio date</th>
<th>Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BSS-3</td>
<td>11,500 ± 2,250</td>
<td>Curvilinear Abstract</td>
</tr>
</tbody>
</table>
engraving. Eight of the remaining 12 engravings are also Curvilinear Abstract, with ages from 7,600 ± 1,800 to 275 ± 50 years B.P. These engravings are illustrated in Fig. 4.

Rectilinear Abstract style motifs (Fig. 5) range in age from 4,750 ± 150 years B.P. to 200 ± 50 years B.P., or essentially into the Historic period for this region. Thus, although the Rectilinear Abstract petroglyphs exhibit a significantly shorter temporal span than the Curvilinear Abstract style motifs, their use occurred over approximately a 5,000 year period.

An additional petroglyph date was obtained on an engraving from the Birchim Springs site in the Coso Range, a location from which a previous cation-ratio petroglyph date had been obtained (Dorn and Whitley 1983, 1984). This motif is a Curvilinear Abstract style design. The age on this specimen, using the calibration for the Coso Region first reported by Dorn (1983) is 11,500 ± 2,250 years B.P., placing it at the end of the Pleistocene. It is illustrated in Fig. 6.

Cultural implications of the cation-ratio dates

The fourteen rock engraving dates reported here, in combination with the previously presented five absolute and relative petroglyph age determinations (Dorn and Whitley 1984), derived from a new and somewhat experimental dating technique, do not allow us
to resolve all problems concerning rock art chronologies in the Great Basin. However, serving as the first suite of direct absolute dates on rock engravings, they allow us to make a series of preliminary observations concerning rock art chronology in this region. These observations pertain to the stylistic chronology for the region in general; the problem of late-Pleistocene rock art production; the evidence for the continuity of rock art production into the Historic period; and the issue of the intensity of prehistoric rock art manufacture, and the concomitant level of prehistoric ritual activity this implies.

The chronology of petroglyph styles in the California Desert

Of major concern in our current study has been the need to define more closely the chronology of the various petroglyph styles from the California Desert region. As noted above, previous absolute chronologies were based largely on intuition, with the initiation of petroglyph manufacture posited to have begun no more than 4,000 years B.P., in the Grant (1968) chronology, and 3,000 years B.P. in the Heizer and Baumhoff (1962) temporal scheme. Similarly, Grant argued for termination in production circa 700 to
1,000 years B.P., while Heizer and Baumhoff hypothesized a cessation in pecking circa 500 years B.P.

Based on the 19 cation-ratio dates obtained from the Cima volcanic field and the Coso Range regions (as well as previous relative chronological studies based on cation-ratio dating; cf. Dorn and Whitley 1984), the relative stylistic chronology first proposed by Julian Steward of Curvilinear followed by Rectilinear and then Representational is supported. However, the actual extent of the production of these styles, and the degree to which they overlap temporally, can be argued to differ greatly from earlier estimates.

Firstly, the Curvilinear Abstract style has thirteen cation-ratio dates. These range from 11,500 ± 2,250 and 10,800 ± 800 to 275 ± 50 years B.P. At a minimum (and using one-standard deviation of the ages for calculation), the production span of this petroglyph style runs from at least 10,000 to 325 years B.P., for a tradition of circa 10,000 years duration. At most this tradition extended from 13,750 to 225 years B.P., for a tradition of over 13,500 years in length. With either estimate the Great Basin Curvilinear Abstract style can be argued to have started during the late-Pleistocene, and to have continued approximately into the Historic period in this region. Thus it appears to have been a very longstanding tradition that continued throughout other cultural changes in this area.

Five Great Basin Rectilinear Abstract motifs have been cation-ratio dated so far. These range in age from 4,750 ± 150 to 200 ± 50 years B.P. Duration of this tradition, similarly, is substantially longer than the 1,500 years guessed at by Heizer and Baumhoff: conservatively or liberally it appears to have been over 4,000 years in length. Importantly, in terms of cultural affiliations of the producers of the petroglyphs, they continued to be pecked into the Historic period in this region. Finally, there is good evidence for the temporal overlap of the Curvilinear and Rectilinear styles, even though the Curvilinear style appears ultimately antecedent to the Rectilinear.

The single date so far obtained on a Representational style motif (from the Coso Range; cf. ibid) is 580 years B.P., or slightly more recent than hypothesized by Grant (1968) for this style of engraving. Although more work needs be done on the dating of Representational style motifs, there is evidence of Historic Representational style petroglyph production in a number of areas of the California Desert, indicating that these engravings continued to be pecked into the recent past. This is discussed in more detail below.

The problem of late-Pleistocene rock engravings

Perhaps of greatest controversy in our use of cation-ratio dating here are the late-Pleistocene dates obtained for engravings Cima 2-5 and Coso BSS-3, with ages of 10,800 ± 800 and 11,500 ± 2,250 years B.P. respectively. Given the scepticism that greets any New World archaeological finding of purported Pleistocene antiquity, we present these dates with recognition that their validity will, and should, be challenged, until further evidence is found that supports these dates. In fact, these dates are not the first late-Pleistocene absolute dates on rock engravings suggested for the California desert region: Turner and Reynolds (1974) have provided late-Pleistocene radiocarbon dates on
engravings in tufa from the Salton Sea region. These dates have been seriously criticized by Wilke and Wilke (1978), and are not widely accepted in the region.

However, there are a series of factors related to the two late-Pleistocene petroglyph dates reported here that provide support for their great antiquity. First, it is important to note that, especially in the case of the Coso calibration curve (which was constructed prior to the use of TAMS C14 dates on Holocene varnish surfaces), the calibration curves are most robust for the late-Pleistocene. Hence, the likelihood of an error in the curve is less probable for the late-Pleistocene than for the extreme Holocene-end of the calibration, where the calibration points are fewer.

Second, Wilke and Wilke (ibid) have criticized previous late-Pleistocene radiocarbon dates on petroglyphs engraved in tufa in part because the region containing these petroglyphs, the Salton Sea, lacked any other evidence of late-Pleistocene human occupation. The Coso Range and Cima/Lake Manix regions, on the other hand, have the best documented evidence for late-Pleistocene occupation in the California Desert (cf. Dorn et al 1986; Davis 1978; Warren and Ore 1978). Given the magnitude of paleoindian remains from these two regions, it would almost be surprising if evidence for late-Pleistocene rock art was not also present. This last point, while arguable, is particularly true in the light of the well known tradition of late-Pleistocene rock art in the Old World.

Finally, there is one form of independent evidence supportive of the late-Pleistocene age for the engraving BSS-3, from the Coso Range. Within this region a varnish micromorphology of lamellate over botryoidal has been found for varnish samples of established late-Pleistocene age (Dorn 1984). Scanning electron microscope analyses of varnish on engraving BSS-3 exhibits this relationship (Plate 1B), supporting our contention for an age assignment to the terminal Pleistocene.

Petroglyph Cima 2-5, however, exhibits only lamellate structures (Plate 1C). This is in accordance with a Pleistocene/Holocene transition cation-ratio date of 10,800 years from the central Mojave Desert region. In this area, unlike the Coso Range, late-Pleistocene botryoidal micromorphology is present in varnish samples TAMS dated at 14,600 ± 800 (AA-800), but is not found in younger varnish, such as varnish sampled from the c. 12,250 ± 2,250 year old shoreline of Lake Mohave at Silver Lake. This has only lamellate structures (ibid). Based on these various lines of support, we feel it reasonable to accept provisionally petroglyphs Cima 2-5 and Coso BSS-3 as examples of late-Pleistocene rock engravings.

**Historic petroglyphs in the California Desert**

The problem of Historic petroglyph production in the California Desert is important because of the repeated denials of such a possibility by authorities such as Julian Steward, Robert Heizer, Martin Baumhoff, and Campbell Grant, and because, with evidence of Historic production, the cultural affiliations of the petroglyph makers can be assigned, thereby allowing for interpretation of the meanings of the engravings in terms of existing ethnographic records (cf. Whitley 1982a). Cation-ratio dating has so-far resulted in the assignment of one Rectilinear style motif to the Historic period (Cima 1-5, 200 ± 50 years B.P.). At least two other engravings are Protohistoric in age (Cima 1-4,
275 ± 50 years B.P., and Cima 2-4, 335 ± 50 years B.P.). Thus cation-ratio dating alone provides some evidence for the continuation of the tradition into the Historic or near-Historic past.

It has been argued that varnish forms only very slowly, such that not sufficient time would have passed for varnish to have appeared on engravings of Historic age (Grant 1968). Scanning electron microscope investigations of historical surfaces in the Coso and Cima regions indicates that measurable amounts of varnish form within the Historic period (Plate 1A). The presence of even microscopic varnish on such youthful surfaces supports an assumption of cation-ratio dating that varnish starts to form within about 100 years in each region.

There is also substantiating evidence for Historic petroglyph production in the form of engravings depicting Euro-American motifs from eastern California. These, obviously, are Representational in style, and include depictions of horses and riders, and wheeled carts (Whitley 1982b; Bard 1979). From the Coso Range one distinctive rider wearing a hat and sitting astride a horse has been illustrated, and we have noted four other possible horse and rider motifs in the region.

In sum, the cation-ratio dates of Protohistoric and Historic age in combination with the Representational style depictions of Euro-American motifs argue for the continuation of petroglyph manufacture into at least the last 300 years in eastern California. It seems reasonable, therefore, to attribute at least some of the rock engravings to the aboriginal inhabitants of the areas in which the petroglyphs have been found. The absence of ethnographic mention of petroglyph manufacture, correspondingly, may be more likely a reflection of incomplete ethnographies, rather than an indication of the lack of such a practice in the recent past.

The petroglyph manufacturing tradition and the intensity of prehistoric ritual activity

Largely because of the denial of the possibility of a Historic rock engraving tradition, Heizer and Baumhoff (1962), and Grant (1968), argued for a termination of petroglyph manufacture sometime during the Late Prehistoric period. Grant both argued for an earlier truncation of the tradition, and recognized that such an early termination in rock engraving implied very intense levels of ritual activities in the Coso Range, to account for the large number of petroglyphs in that region. Although it is impossible to fully define

Plate 1 Scanning electron micrographs of incipient varnish and varnish on petroglyphs. (A) Incipient varnish on a faced surface of Fort Piute, constructed in 1868 in the Mojave Desert. The presence of varnish on this surface supports the important assumption of cation-ratio dating in the Mojave that varnish starts to form on a fresh surface within approximately 100 years. Scale bar, 5 microns. (B) Varnish micromorphological stratigraphy on Coso petroglyph BSS-3. The line represents the contact between the underlying rock and the varnish. Above this contact is a botryoidal layer of varnish. Above the subsurface botryoidal varnish is a surficial layer of lamellate varnish. The presence of a subsurface botryoidal layer is diagnostic of late-Pleistocene age for this region. Scale bar, 5 microns. (C) Entirely lamellate varnish on Cima petroglyph 2-5, as would be expected from this region for a date of ca. 10,800 years B.P. The line represents the varnish/rock contact. Scale bar, 5 microns.
the intensity of petroglyph manufacture over time throughout the southern Great Basin without a very large sample of cation-ratio dates, we feel that the dates presented here further substantiate our argument (Dorn and Whitley 1984) that the large numbers of petroglyphs present in the Coso Range in particular, and the California Desert in general, reflect a very long tradition of ritual and rock engraving, rather than a cult that floresced and died prior to the ethnographic period. Hence, Steward’s notion that southern Great Basin petroglyphs signify a cultural devolution vis-a-vis the ethnographic period is probably unwarranted.

Conclusions

Fourteen newly obtained cation-ratio dates on petroglyphs from eastern California, in combination with dates previously obtained, allow for a provisional estimate of the chronological placement of petroglyph styles in this region. Two dates on Curvilinear Abstract motifs, from different areas of the California Desert, are late-Pleistocene in age, and suggest a minimum antiquity of over 10,000 years for the Curvilinear style in this portion of North America. A varnish sample from the older of these two dates, sample Coso BSS-3 (11,500 ± 2,250 years B.P.), exhibits a micromorphological structure that only occurs in late-Pleistocene contexts, thereby providing substantiating evidence for this early chronological placement. The remaining Curvilinear Abstract motifs so-far dated indicate a temporal range into the very late protohistoric, at 275 ± 50 years B.P. We find no evidence to support the contentions of earlier researchers who argued for the beginning of the Curvilinear Abstract tradition only three to four thousand years ago, and a cessation in this style 500 to 1,000 years B.P.

The Curvilinear Abstract style appears to be chronologically antecedent to the Rectilinear Abstract style, in accordance with earlier estimates of relative chronology, based on the dates presented here. However, this style, too, is indicated as somewhat greater in age than the maximum of 2,000 years B.P. previously suggested: our dates indicate a temporal span from circa 4,500 years B.P. to the Historic period for Rectilinear Abstract petroglyphs in this region.

The Representational style has only received one cation-ratio date at the time of writing. This date, of approximately 580 years B.P., is also suggestive of temporal placement after the Curvilinear and Rectilinear Abstract styles, although a single date is insufficient for reasonable chronological positioning. Continued dating of Representational style motifs is perhaps the greatest need, in terms of establishing petroglyph style chronology, for eastern California.

Six of the nineteen (or over 30%) of the cation-ratio dates on rock engravings are 1,000 years, or less, in age. Although our sample of dates may not represent the complete temporal span of petroglyph manufacture in the eastern California, the age range of these dates is suggestive of the importance of Late Prehistoric, protohistoric, and Historic periods engraving of petroglyphs. In combination with noted representations of Historic motifs, these dates provide a clear indication of petroglyph manufacture into the ethnographic period. Earlier arguments that no petroglyphs were engraved by ethnographic groups, based on an absence of the mention of such activities in 20th
Century ethnographies, more probably reflect rapidly changing cultural patterns during the period of acculturation, rather than the production of petroglyphs solely by unknown prehistoric groups at indeterminate periods in the past.

It has been suggested that because the Great Basin Curvilinear and Rectilinear Abstract styles are similar to engravings found elsewhere in the American southwest, they form a portion of an Archaic cultural substrate found throughout far western North America (e.g. Sutherland 1975). The cation-ratio dates on these styles from eastern California substantiate the notion that these petroglyphs were manufactured during the Archaic period. However, the dates also suggest the initiation of this tradition in the late-Pleistocene, or paleoindian period, and its continuation into the Historic period. Hence we argue that the notion that such styles are solely Archaic in age in the Great Basin belies the longevity of the styles, as well as probable changes that may have occurred in their ritual function and meaning over the 10,000 year duration of their manufacture.

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References


Abstract

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Rock Art chronology in eastern California

Cation-ratio dating has allowed us to obtain chronometric ages for 13 rock engravings from the Cima region, and an additional date from the Coso Range, eastern California, North America. These fourteen new dates, in combination with five previous dates from the Cosos and other lines of evidence, enable us to reassess the rock engraving chronology for eastern California. Rock engraving is indicated as beginning in the Late Pleistocene and continuing into the Historic period, rather than the short 1500 to 3000 year prehistoric spans of production previously hypothesized. Stylistic chronologies of curvilinear followed by rectilinear and representational motifs are also provisionally supported by our results.