Writing on the walls: geological context and early American spiritual beliefs

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Abstract: Native American culture in many parts of California is preserved in fragmentary oral and conventional written histories, but also in sometimes dramatic petroglyphs and pictographs throughout the state. The symbolism of these images has been interpreted to reflect the natural environment, in particular issues related to rain. Although there is little doubt that rain was of paramount concern to native tribes, I suggest that geological context also played an important role in shaping early spiritual beliefs in general, and petroglyph sites in particular. From the standpoint of Native American philosophies and spiritual beliefs, geological unrest is not merely a reflection but in some cases an actual embodiment of the spiritual world. To understand the significance of petroglyph sites, they must be considered in the context of overall Native American beliefs. In this context, sites of repeated geological unrest would invariably have evolved great spiritual significance. Petroglyph locations and ages may thus provide independent age controls on 'prehistoric' earthquakes in California.

Petroglyphs: history and conventional interpretations

The conventional history of California dates back only to the late eighteenth century: the 1769 Gaspar de Portola expedition was the first land exploration of present-day California by people of European descent. However, the usual distinction 'historic' versus 'prehistoric' reflects an immediate bias: for thousands of years before 1769 California was inhabited by native tribes who (it is generally believed) first immigrated to North America along a Bering Strait land bridge.

Early California tribes left behind no conventional written history. However, they did leave their mark on the land itself: intriguing and sometimes intricate art painted or etched onto rock (Whitley 1996). Rock art comprises two distinct forms: petroglyphs, which are etched into rock (and sometimes painted as well), and pictographs, which are only painted. The former are less easily erased by weather and erosion. Petroglyphs and pictographs were a nearly ubiquitous form of expression among cultures with no tradition of conventional writing (e.g. Moore 2003). Drawing on the expertise of living tribe members, archaeologists have pieced together explanations for the sometimes intricate symbology (Patterson 1997; Moore 2003).

Clearly, rock art represented a complex form of expression and served more than one function. The practice was strongly associated with shamanism: the traditional medicine men who were considered to have the ability to commune with supernatural powers (e.g. Hedges 1976, 1992; Whitley 1992, 1996). The tradition of the shaman's trance, generally induced by natural hallucinogens such as native tobacco, is also well established. Anthropologists have shown that the response of the brain in trances is essentially 'hard-wired'; a function of humanity rather than local culture (Lewis-Williams & Dowson 1988). According to modern research, people in trances experience four types of reactions including both audible and visual hallucinations. Moreover, the latter tend to fall into several established categories, including wavy or parallel lines, nested curves, and spirals.

The brain is essentially programmed to visualize certain patterns: the rock art of native California peoples was inevitably also shaped by their culture. Zigzag lines, one of the most common patterns found in rock art, can be understood in terms of the 'neurophyschological' model (e.g. Lewis-Williams & Dowson 1988), yet were often imbued with a culture-specific meaning, in particular related to snakes and serpents.

Snakes and serpents, in turn, were commonly associated in many early cultures with unrest within the earth. In legends of the Mogollon culture in southern New Mexico and northern Mexico, the Horned Serpent is at times fierce and punitive, and is credited for causing both floods and earthquakes (Schaafsma 1980). Ludwin *et al.* (2005) suggest that reports of the AD 900 Seattle earthquake were handed down for 1100 years by storytellers, in the form of stories about a horned

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water-serpent said to have lived near the Seattle fault. At Nanaimo Petroglyph Park in British Columbia are images of the Kwakiutl Sisiutl, a double-faced serpent with a snout resembling that of sea snakes (Moore 2003).

'Wiggly line' motifs are also interpreted in other ways. Whitley (1996, 2002) interprets wiggly lines in California petroglyphs in terms of 'rain shamanism': spiritual beliefs centred around rain-making.

Shaman sometimes travelled considerable distances to reach locations that were strongly associated with supernatural powers (Whitley 1996). Historical evidence documents the pilgrimages made by shaman from as far away as northern Utah to one of the most famous petroglpyh sites in the Coso area on the eastern side of the Sierra Nevada. Shaman had many reasons for seeking communication with the sacred realm, including rain-making, curing (and maybe sometimes causing) illness, and commemoration of puberty rites (e.g. Oxendine 1980). In arid desert regions in California and the Southwest, surviving legends—and rock art—invariably portray drought as the natural hazard of prime concern.

But if the archeologists' understanding of California petroglyphs focuses on the spiritual, the seismologist considering a map of sites in the state cannot help but be struck by a different thought: many of these sites are close to especially seismically active parts of the state.

Is it possible that California's earliest inhabitants left writing on the wall in response to California's earliest historic earthquakes? That rock art is found close to faults is not in itself surprising, as, to a fair approximation, rocks in California are found in proximity to faults. Away from the state's fault-controlled mountains, are valleys and basins filled with sediments that have washed down from higher elevation over the ages. With this caveat in mind, in the following sections I summarize the petroglyphs and other lore from several specific regions in California (Fig. 1). I then move on to discuss these sites in the context of overall Native American beliefs, in particular with respect to the natural environment.

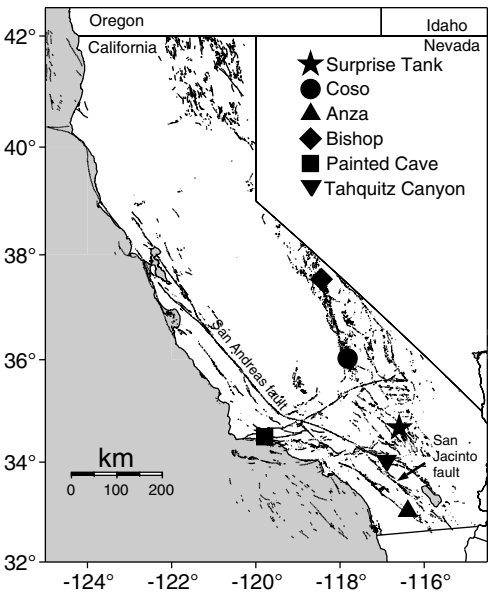

Fig. 1. Map of California petroglyph and pictograph locations discussed in this paper. The Little Blair Valley petroglyph site (upward triangle, 'Anza') is within the larger Anza–Borrego region. Active faults are also shown (Jennings 1994).

Coso

The Coso region is known for a high current rate of earthquake activity in modern times and volcanic activity in recent geological times. Although the last eruption was several thousand years ago, underground magma still exists close enough to the surface to generate an economically exploitable source of geothermal energy (Austin 1978). The ongoing volcanic processes in turn give rise to high rates of earthquake activity as well as obvious manifestations of active geothermal processes. Coso experiences one of the highest rates of potentially felt (magnitude 3+) earthquakes of any place in California; very typically earthquakes will occur in swarms of hundreds of events. Six moderate earthquakes, with magnitudes of 5.0–5.8, struck in or near Coso during the 1990s; in this same time period nearly 300 earthquakes of magnitude greater than 3.0 occurred near enough to Coso to be felt there.

Still, the existence of a correspondence between two phenomena is not enough to demonstrate a cause-and-effect link. To argue for a causal relationship requires evidence beyond a simple correspondence.

Some petroglyphs are strongly suggestive of unrest within the earth (Figs 2, 3). Interestingly, the shamans shown in (Fig. 2) are notably common in the Coso area. Patterson (1997) refers to such figures as 'patterned body anthropomorphs', and notes that they are found commonly in Coso and in the northern Sonora desert in Mexico; shaman pictographs from other regions are not commonly adorned with such elaborate internal patterns. Whitley (2002) interprets the figures as 'rain shamanism' because drought was of paramount concern for tribes throughout the arid Great Basin. As he notes, however, this begs the question of

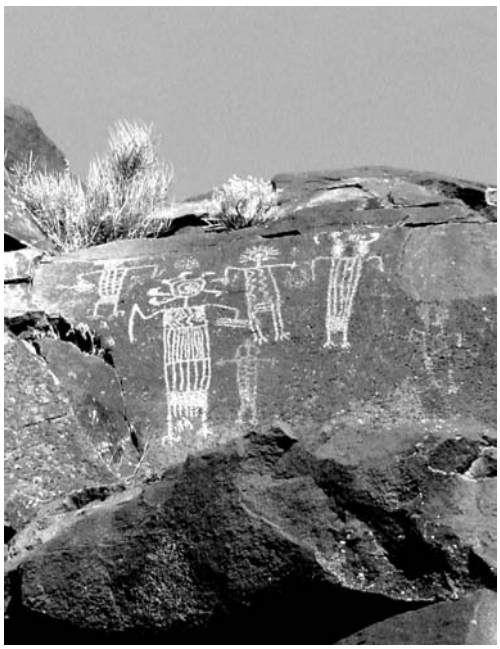

Fig. 2. Patterned-body anthropomorphs (shaman figures) at the Coso site.

why an 'immense concentration of rain-shamanism rock-art [would be found] within the Coso Range, an arid landscape west of Death Valley, the driest spot in the Great Basin'. Noting that 'coso' translates literally as 'fire,' Whitley suggests that the region became associated with rain because of 'symbolic inversion'. Symbol rituals operated on the principle of inversion. He argues that shaman journeyed specifically to this markedly arid region to 'find the most verdant aspect of the supernatural and, from this experience, to make rain in the natural world'.

However, the translation of the word 'coso' suggests a more direct interpretation. The Coso volcanic field consists of Pliocene to Quaternary rhyolite domes and basaltic cinder cones covering 150 square miles (Duffield 1975). The most recent eruption of Red Hill, just west of Coso, was 10 000–14 000 years ago; a small flank eruption may have occurred as recently as 400 BP (Lanphere *et al.* 1975). Humans first arrived in the region between 10 000 and 20 000 years ago (e.g. Gilreath & Hildebrandt 1997); it is thus likely that the earliest human settlers in the Mojave Desert would have stumbled across active volcanism, leading to a name meaning 'fire'. Even today, the Coso region exhibits obvious manifestations of an active geothermal region, such as boiling mud pools. Native Americans in the region today, descendents of earlier tribes, speak of an association between the ongoing geological unrest and the spiritual significance of the region (David Garboni pers. comm., 2004). Following this line of reasoning, the squiggly lines within the Shaman figures still represent symbolic communication with the supernatural, but via 'volcano shamanism', or perhaps 'earthquake shamanism', rather than 'rain shamanism'.

One can appeal to several possible explanations for why patterned body anthropomorphs are also found in northern Sonora. The area also experiences strong earthquakes, for example a large (M7+) earthquake in 1887 (e.g. Sbar & Dubois 1984). Art styles can also simply be imported from one region to another. However, such explanations are speculative. The key point is that these distinctive petroglyph styles are abundant in the Coso area in particular and not found commonly, if at all, in other regions.

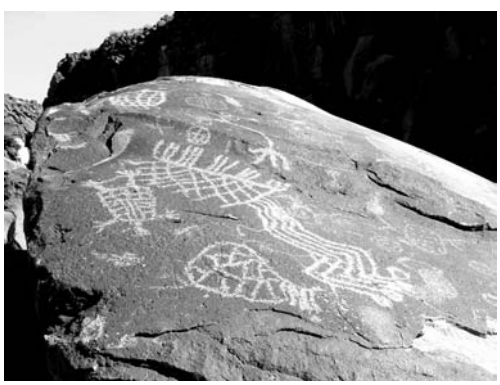

Fig. 3. A petroglyph at the Coso site that appears to depict volcanic activity. The central image in particular is suggestive of steaming or erupting ground, with lava flowing towards the right. The overturned anthropomorphic figure and pot are further suggestive of effects of an eruption on human settlement. (To the author's knowledge, this is the only anthropomorphic figure of many in the area that is not drawn upright.)

Surprise Tank

The Surprise Tank petroglyph site represents a substantial concentration of rock art in the Mojave Desert. This site is extremely remote: about 30 km SE of Barstow (population 21 000) and 30 km SW of Ludlow (often regarded as a 'ghost town'.) At the Surprise Tank site there is a remarkable concentration of 'wiggly line' motifs, with relatively few of the symbols, such as sheep and shamans, that are found commonly at other petroglyph sites. These wiggly lines are both vertical (Fig. 4) and horizontal (Fig. 5). As previously discussed, early cultures commonly use 'wiggly line' motifs to

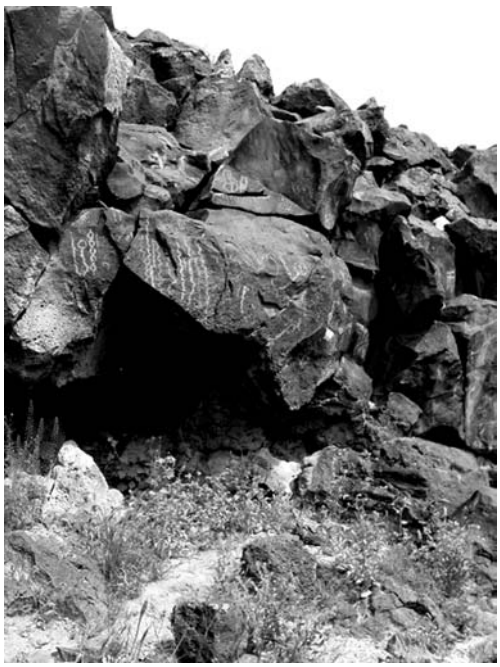

Fig. 4. An example of the prominent 'wiggly line' motifs found at the Surprise Tank site in the Mojave desert.

Fig. 5. A second example of a wiggly line motif at Surprise Tank. The seismologist notes an intriguing similarity to a modern seismogram.

represent snakes and serpents; snakes and serpents are, in turn, commonly associated with geological unrest.

The location of the site is approximately 5 km from the northern end of the 1992 Landers rupture (Fig. 6). Geological investigations reveal the penultimate rupture on these faults occurred 5800 years BP (Rockwell *et al.* 2000), which also overlaps with the period of human habitation at this site. The oldest dated petroglyphs at Surprise Tank are estimated to be about 10 000 years old (Whitley 1996).

The strongest recorded shaking during the 1992 Landers earthquake, 798 cm s^{-2}, occurred at station LUC, about 5 km from the Surprise Tank site. Shaking of this severity is associated with Modified Mercalli Intensity IX: strong enough to cause serious damage to well-built masonry structures and substantial liquefaction and other ground failure. In prehistoric times, this level of shaking—along with the energetic aftershock sequence that would invariably have followed—would almost certainly have been a profound event, and one that would probably have been interpreted in spiritual terms. Moreover, both geological evidence (Rockwell *et al.* 2000) and recent history suggests that large Mojave Desert earthquakes are clustered in time. Common sense suggests that a succession of large earthquakes would have likely made an especially indelible impression.

Owen's Valley

Four petroglyph sites are located east of Bishop, in Paiute territory just south of Long Valley Caldera.

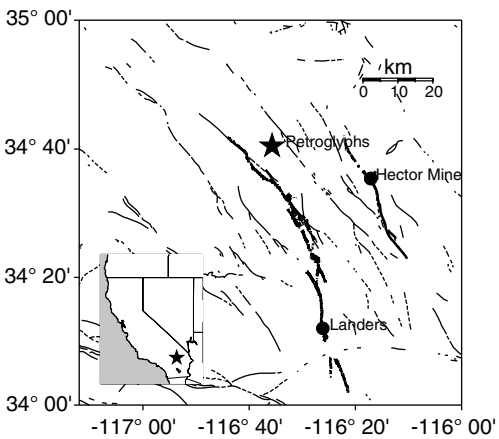

Fig. 6. Map showing the location of the Surprise Tank site as well as the mapped surface ruptures (dark lines) and epicenters (circles) of the 1992 M7.3 Landers, California and 1999 M7.1 Hector Mine earthquakes. Mapped faults are also shown (light lines).

These sites (access to which remains restricted) include the Chidago site, where 'the majority of the motifs . . . are entoptics, the geometric patterns perceived during the initial stage of a shaman's trance' (Whitley 1996). Because these petroglyphs were inscribed on volcanic tuff, a relatively soft rock that is easily eroded, the petroglyphs are thought to be of relatively recent origin: about 1000 years, or less.

Again, this overlaps with periods of known, significant volcanic unrest. The caldera-forming eruption of Long Valley, just north of Bishop, occurred approximately 760 000 years ago: however, Long Valley has remained volcanically and seismically active through to recent Holocene times (e.g. Bailey 1989). Smaller eruptions have occurred within the last 600 years, including lava flows and more explosive eruptions (Miller 1985). These recent eruptions occurred towards the NNW side of the caldera; but, in recent decades, the region to the SSE of Long Valley has been highly active seismically (e.g. Hill *et al.* 1985). Savage & Clark (1982) showed that this seismic activity can be explained as a response to deep magma movement within the caldera. Thus, the Bishop petroglyphs are concentrated in a region that experiences high rates of earthquake activity in response to ongoing volcanic processes at Long Valley.

Anza–Borrego

Petroglyph sites abound within the Superstition Mountains and their environs. Many of them are intricate and evolved. Rock art sites are so abundant in the Superstition Wilderness area that some scholars have proposed that native peoples in this region simply had a great deal of free time on their hands. Although this explanation is discredited by serious archeologists, it does testify to the prevalence of features in this area.

As summarized by Knaak (1988), distinct styles of rock art are found in the Anza–Borrego area. To the NNE of the modern town of Borrego Springs one finds the so-called western petroglyph style that is found throughout much of the Great Basin and Southwest. A distinct San Luis Rey style is found to the WNW of Borrego Springs, in regions once inhabited by the Northern Diegueno tribe. This art dates from about 1500 AD. The San Luis Rey style is characterized by rectilinear motifs primarily in red, including vertical rows of chevrons, dots, Xs, zigzags, and diamonds. The well-known Little Blair Valley site within Anza–Borrego Desert State Park contains multiple panels and motifs, predominantly combinations of zigzag lines and diamond chains.

The Anza–Borrego region has experienced a high rate of large earthquakes over at least the last 10 000 years. The Little Blair Valley is located within a region that is more broadly known as 'Earthquake Valley' (For example, this is the name of the USGS 7.5' topographic quad of the region). The Superstition Mountains are almost literally surrounded by active faults, including the San Jacinto fault system, one of the most active faults in California. According to the most recent scientific investigations, the San Jacinto and southern San Andreas faults are the two dominant plate boundary faults in this region. Somewhat surprisingly, it is possible that these two faults might now experience comparable strain rates (Anderson *et al.* 2003). The San Jacinto fault may experience relatively more frequent, but somewhat smaller shocks than the southern San Andreas fault (Wesnousky 1994). In recent years, the single most active fault in California, at least as measured by the rate of magnitude 2–6 earthquakes in recent decades, has been the San Jacinto fault. As was the case at Coso, the correspondence is striking: abundant earthquakes, abundant petroglyphs.

Earthquake iconography in other cultures

The suggestion of 'earthquake iconography' in California rock art is by no means without precedent. Earthquakes and other natural phenomenon feature clearly in the iconography of other cultures where geological unrest is common. In central and northern Mexico, pictorial codices are known to depict not only earthquakes but also in some cases to indicate the number of events and dates (see Kovach 2004, for a recent summary).

Other dramatic natural phenomena were clearly interpreted as spiritual signs in other cultures, and depicted in rock art and other forms of iconography. Comets were commonly viewed in spiritual terms in early cultures (e.g. Sugden 1995). Solar eclipses were also interpreted in this manner: among the Tewa peoples of the Rio Grande solar eclipses were interpreted as a sign that the Sun Father had moved farther away from the Earth out of displeasure with human behaviour (Williamson 1987). Masse & Espenak (2006) discuss the connection between natural phenomena, in particular solar eclipses, and the iconography of the early Hohokam culture of the American Southwest. Because dates of past eclipses can now be determined with precision, it is possible to compare in detail the correspondence between specific eclipses and cultural imagery (Masse & Soklow 2005). It might be possible to investigate such correspondences for the sites discussed in this paper, although

such an approach would be complicated by an imperfect record of past geological events as well as, in some cases, the fact that geological unrest at locations such as Coso is often persistent rather than strongly episodic.

Echoes from the past: surviving oral traditions

Interpretations of rock art are inevitably subjective, the aforementioned correspondences notwithstanding. However, in some cases one can also consider surviving oral traditions. These include stories told by the Southern Diegueno tribe, for whom the Superstition Mountains featured prominently in their oral traditions (Strand 1980). The very name of the mountains reportedly resulted from an earthquake that occurred during a ceremony by ancient tribe members. Other legends describe moans and terrible sounds emanating from the caverns at the base of the mountains. These caverns were believed to be the home of a great and evil serpent that changed the very face of the mountain with his writhings. (Here again one finds the association mentioned earlier: snakes and quakes).

The creation myth of other tribes, including the Northern Diegueno and Kumeyaay, also incorporated earthquakes. In these stories, the world was formed by two brothers, Tuchaipa and Kokomat, who sought to create man out of yellow clay. Unable to create figures as successfully as his brother, Kokomat returned to the earth beneath the sea, where he was said to create earthquakes as he moved about (Knaak 1988).

The roots of the Cahuilla Indians trace back to the Palm Springs area. Their legends describe Tahquitz Canyon, at the foot of Mount Tahquitz just south of Mount San Jacinto, as the home of the spiritual being Tahquitz. According to legend, Tahquitz is immortal and malevolent, stealing the souls of young women who dare venture too far into the canyon at night: his growlings account for the rumblings sometimes heard emanating from the mouth of the canyon. One version of the 'Tahquitz legend', published in 1950, mentions an earthquake explicitly:

> No sooner had her lips sounded the last syllable of the feared name (Tahquitz), than there was an explosive-like rumble from the direction of Tahquitz Canyon. It grew steadily louder until it became a deafening roar. The earth shook and quivered underfoot. Rocks tumbled loose and started landslides. Clouds of dust curled into the overhead darkness (Smith 1950).

Almost all of the petroglyphs within Tahquitz Canyon have been erased by vandalism, but surviving remnants of one prominent image near the mouth of the canyon appear to depict a large shaman and a snake.

Like Anza–Borrego, Tahquitz Canyon is surrounded by active faults, most notably the San Andreas fault to the north and the San Jacinto fault to the south and west. Fumal *et al.* (2002) present evidence that 4–5 surface-rupturing earthquakes occurred along the Mission Creek strand of the San Andreas fault in the last 1200 years. The most recent large earthquake appears to have been in the late seventeenth century (Sieh & Williams 1990). Sieh & Williams (1990) preferred date for the most recent event is 1676 $\pm$ 35 years. Interestingly, this is close to the inferred date of the most recent Cascadia megathrust event (Satake *et al.* 1996): it is thus reasonable that an earthquake might figure as prominently in the present-day Tahquitz legend as does the 1700 Cascadia event in present-day Pacific Northwest oral traditions.

A final observation is that the competent granitic rocks of the San Jacinto mountains are a known 'high-Q' environment (Hough & Anderson 1988): potentially audible high frequency energy generated by earthquakes on the San Jacinto fault will travel efficiently between in this environment, consistent with reports of audible rumblings and 'moanings'. A journalist who lives near the mouth of Tahquitz Canyon reported that earthquakes are very commonly heard before they are felt (David Garcia pers. comm., 2004).

Although earthquakes are not a major theme in the legends and stories of native California tribes, surviving stories, such as those discussed above, indicate that earthquakes were a familiar part of life for these peoples. Ludwin (2002) reaches a similar conclusion about oral traditions from the Pacific Northwest region of North America.

Geological unrest and spiritual beliefs

Although 10 000 years is a very long period of time by cultural standards, it is a very short period of time by geological standards. It is therefore likely that California's earliest residents experienced earthquake rates that were similar to those seen in recent times. The duration of human habitation in prehistoric times was much longer than the short historic record in California, spanning several thousand years that are known to have included a cluster of earthquakes in the Mojave Desert and active volcanism at Coso, as well as many major earthquakes on the San Andreas fault.

Clearly, no one explanation can possibly account for all rock art in California, or anywhere else. These drawings had complex and disparate purposes, perhaps practical as well as spiritual. But it cannot long escape the attention of any resident of California that they are living in earthquake country. Indeed, the Portola expedition experienced

a series of earthquakes near present-day Santa Ana in 1769.

Further, geological unrest has been interpreted in spiritual terms in more modern, 'western' cultures as well. Through historic times in western civilization, earthquakes such as that in 1755 in Lisbon, which struck on the morning of All Saint's Day, were commonly interpreted in spiritual terms, typically, 'signs from God'. (John Wesley, credited as the founder of the Methodist Church, preached famously that 'earthquakes are the works of the Lord'. See http://www.segen.com/wesley/sermon04.html).

It would be more surprising if earthquakes, and other attendant phenomenon, did not figure prominently in the oral traditions and spiritual beliefs of native tribes. This inference may appear speculative, but it is also important to consider petroglyphs in the context of the overall Native American view of the natural environment. The association of seismic and volcanic unrest with spiritual forces is a common theme among earlier (and sometimes recent) legends and stories. In the State of Hawaii, traditional cultures have remained part of the modern cultural fabric to a greater extent than native cultures have in California. In Hawaii, one does not need to resort to inference to interpret native stories and petroglyph sites. Stories from a still-vibrant culture link the prominent gods with the Island's volcanoes. At the Pu'u Loa site on the flanks of Kilauea volcano one finds the largest concentration of rock art anywhere in Hawaii: over 20 000 separate petroglyphs of human, animal, and geometrical form (Lee & Stasack 1999).

The Pu'u Loa site perhaps illustrates how locations of pronounced volcanic unrest were naturally (one is tempted to say 'invariably') interpreted as sites of spiritual significance. The petroglyphs themselves may not be directly linked to geological unrest, and the specific location of the Pu'u Loa site might have been chosen for practical reasons. In a broader sense, however, the active volcano was—and still is—viewed as a portal to the supernatural world by virtue of its geophysical attributes. This view of sacred sites is expressed by Versluis (1992), who describes current philosophies:

> We have discussed in an earlier context how certain places manifest special power. There are translucent places through which the spiritual landscape is particularly visible: petroglyph sites, for instance, or sacred mountains. These sites are particularly sacred because there the spirit realm is closest to the human world.

Lake-Thom (1997) further illuminates the view of sacred sites:

> . . .some of the larger mountains, such as Mount Shasta and Mount Saint Helens, were not used for vision quests and power training by indigenous people not because the Indians lacked sophisticated mountain climbing skills, but because they 'knew exactly what kind of power was there and the reason it was there.' 'Native people recognized certain mountains not as the home of spirits and gods but as a giant spirit in the hierarchy of Earth spirits. My elders have taught me that such places are where the Great Creator resides from time to time'.

Lake-Thom further notes that the conventional western interpretation of Mount Saint Helens focuses on geological unrest, whereas the Native American view focuses first on 'why the power centre is powerful *per se*'. In this view, all power centres have a 'specific purpose and function'. He further distinguishes shaman as uniquely able to connect with spiritual power, whereas most people cannot.

Intriguingly, the above passage from Lake-Thom (1997) is reminiscent of the Bible passage, Exodus 24: 16–17: 'The presence of the Lord abode on Mount Sinai, and the cloud hid it for six days. On the seventh day He called to Moses from the midst of the cloud. Now the Presence of the Lord appeared in the sight of the Israelites as a consuming fire on the top of the mountain'.

Considered in the context discussed by Lake-Thom (1997), sites of persistent geological unrest represent not only a portal to the spiritual world, but in some cases nothing less than an embodiment of it. A modern scientific view distinguishes Mount Shasta and Mount Saint Helens as two of the larger, more active volcanoes in the Cascadia chain: the Native American view distinguishes them as the incarnation of the Great Spirit. This leads to the 'speculative' conclusion expressed earlier: the spiritual significance of sacred Native American sites was inexorably intertwined with (literally 'rooted in') their geological settings. Indeed, in the context of Native American beliefs, the view is not that 'spiritual significance stems from geological unrest', but rather that 'geological unrest stems from spiritual significance'.

Having reached this conclusion, it appears that in some cases, California's surviving petroglyphs and pictographs represent a written record of 'prehistoric' earthquake and volcanic activity. This hypothesis could be tested further by comparing dates of petroglyphs at sites such as Coso and Surprise Tank with the timing of volcanic/earthquake activity as estimated from geological investigations.

If the results of such comparisons supported the hypothesis, rock art locations might provide clues to previously unrecognized 'prehistoric' activity. One intriguing site, for example, is found in the Sierra de San Francisco in Baja California. Described in detail by Crosby (1997), the Cueva de la Serpiente site features a remarkable mural approximately 8 m in length: a horned serpent feature around which 50 human and animal figures are positioned. 'The small figures do not

interfere with the movement of the large one; indeed, their placement creates an odd, rocking effect that enhances the apparent weaving of the serpent' (Crosby 1997). Crosby goes on to note that, compared to the usual style in which animals are drawn very simply and literally, 'The conception of the serpents is astonishing. In any context these eared, antlered, and fork-tailed monsters would seem bizarre and fanciful concoctions. In the land of the Great Murals, where animals regularly have literal outlines, they are downright iconoclastic'. Crosby further notes that in front of this cave, the arroyo, which is aligned generally north–south, makes a sharp bend east and then in 183 m makes another sharp bend to continue to the north—a description that is tantalizingly suggestive of an east–west trending strike-slip fault.

A second intriguing site is the Chumash Painted Cave Pictographs just north of Santa Barbara, California. The painted panels are thought to be recent, no more than 1000 years old, and are dominated by dramatic geometric motifs in which snake images figure prominently (Whitley 1996). Whitley likens two shaman figures at the site to the patterned-body anthropomorphs found at Coso, and discusses the strong undercurrent of supernatural themes evident in these and other paintings at the site. In this case, the site is located almost directly on top of a known active fault: the Arroyo Parida fault, part of a larger system of east–west trending left-lateral faults that run along the southern flank of the Santa Ynez Mountains (Jennings 1994).

Like many faults in California, the Arroyo Parida fault is active but little is known about earthquake occurrence on the fault through the Holocene. Rock art sites such as Painted Cave, as well as Cueva de la Serpiente and others, may in fact represent a previously unrecognized historic record of earthquake (and volcanic) activity during the Holocene, and may thus help point scientists to particular fault locations where further field investigations are warranted. I note in closing that petroglyphs and pictographs represent a written record, albeit an unconventional one. The conventional distinction of 'historic' versus 'prehistoric' thus represents an inherent—perhaps outdated–cultural bias.

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