

Creating Thunder: The Western Rain-Making Process

E. BRECK PARKMAN, California Park Service, Silverado District, 20 East Spain St., Sonoma, CA 95476.

THERE are few things more awe-inspiring than thunder and lightning. The mighty roar and fiery light can fill the mind with images of the supernatural and bring forth both fear and reverence. For that reason, "celestial thunder" (i.e., the meteorological phenomenon) is recorded in the mythologies of various cultures (cf. Blinkenberg 1911; Spence 1914:126; Eliade 1958; Willcox 1963:34; Needham 1967a; Courlander 1975:159, 162, 188, 201-203; Holtkrantz 1979:260; MacKenzie 1985:1-5; Ashby 1989:109). Thunder is almost always personified as a spirit inherent in the storm, and it has been looked upon by many cultures as the voice of a god, "Sacred Thunder" (a psychological phenomenon). Sacred Thunder often "chose" future shamans by hitting them with lightning (cf. Eliade 1964:19, 100).

Celestial thunder is usually thought of as a precursor to rain, and, in various mythologies, the two are associated. In California and elsewhere, communities initiated ritual means for making or stopping rain. Sacred Thunder was common in native Californian mythologies, and intimately associated with the weather (cf. Loeb 1926:301; Driver 1936:217; Foster 1944:204; Blackburn 1975:105-107, 113, 223-224, 273; Jewell 1987:161; Merriam 1992:69). By creating "ritual thunder" (a cultural phenomenon), weather specialists may have invoked Sacred Thunder as an ally in their quests.

This paper examines thunder, and its association with native Californian rain-making traditions. Although the discussion considers all of native California, it is focused primarily on

the northern part of the state. Two related hypotheses are advanced herein. First, it is proposed that native Californian rain-makers accomplished their tasks by ritually creating one or more aspects of the storm (i.e., thunder, cloud, wind, or rain). Second, it is proposed that some pitted boulders represent percussive implements used by shamans to achieve altered states of consciousness, a condition necessitated by their rain-making activities. The ethnographic and archaeological data leading to these hypotheses suggest the "Western Rain-Making Process" described in this paper.

THE THUNDER GOD

The mythologies of ancient Europe and Asia speak of a Creator, the "Hammer God," who fashioned the universe with his hammer (MacKenzie 1985:1-3). Known in India as *Indra*, the Hammer God brought rain when it was dry, and also slew the monsters, giants, and enemies of the world. In doing so, he became the God of War. *Indra's* hammer was a thunderbolt, which eventually became an axe in mythology. In southern Europe, the Hammer God was *Zeus-pater* (Jupiter), who wielded a thunderbolt (MacKenzie 1985:3).

The Thunder God was often associated with the clashing of rocks. For example, the Penan of Indonesia believed that *Balei Liwen*, the Thunder God, was made of stone, this being the cause of his thunder (Needham 1967a:275). In China, *P'an Ku* was thought to have broken the primeval rocks with his hammer (MacKenzie 1985:2). A Hawaiian thunder god was known as *Kapohakaa* ("Rock Roller") (Lévi-Strauss

1966:96), and *Shango*, the thunder god of West Africa, was sometimes called *Jakuta* ("Stone Thrower") (Courlander 1975:188). At Obiri Rock, in northern Australia, the Kakadu associated *Namarrgun* ("Thunder Man") with an outcrop's cupules and mortars, in which paint pigment was prepared (cf. Welch 1982:82). Finally, in a Blackfoot myth, Sacred Thunder lived in a lodge made of stone (Harrod 1987:70). Eliade (1964:139) associated "thunderstones" with the concept of a solid celestial vault, not unlike a stone lodge.

Celestial thunder was as feared and revered in the Americas as it was elsewhere in the world. On much of the North American continent, stories of the "thunderbird" abounded (Hultkrantz 1979:50-52, 114). For example, the Oglala Sioux believed that *Wakan-Tanka* (Thunderbird/Creator) controlled the waters and protected the "sacred pipe" (Brown 1971:39). In some areas, the thunderbirds were conceived of as human-like beings who strapped on large wings and, with arrows in hand, went traveling through the sky. In other areas, the thunderbirds were imagined to be large bird-like creatures. In either case, thunder was believed to have resulted from the flapping of their wings (Hultkrantz 1979:50).

In many areas of North and South America, celestial thunder was personified as a supreme deity (see Spence 1914:125-126, 217; Hultkrantz 1979:194-195, 199, 221, 225-226, 260, 266). Sacred Thunder was perceived as the God of War by many North American tribes. Just as the warrior was armed with a spear or arrow, so too was Thunder armed with his lightning (cf. Tyler 1964:101; Neihardt 1979:166). This was especially true in the Great Plains, where warrior societies associated thunder with war, and stone projectile points were associated with Sacred Thunder's lightning (see Teit 1898:39; Michelson 1929:41; Parsons 1939:692; Benedict 1969:76-77; Mails 1973:270-272; Lummis 1992:76). On the Northern Plains, pit-and-

groove boulders, known locally as "ribstones," may represent vision quest sites associated with Sacred Thunder and bison hunting (cf. Wormington and Forbis 1965:170-172; Parkman 1993a).

Lightning strikes were observed, and were utilized by rain-makers. For example, the Pima of southern Arizona appear to have incorporated lightning strikes into their rock art, and probably used the sites for subsequent rain-making ceremonies (Hoskinson 1990:107). Lightning strikes were incorporated into rock art in southeastern Oregon and northeastern California as well (Benson and Buckskin 1991). Native Californian rain-makers occasionally burned the splinters of trees hit by lightning (cf. Dixon 1907:470-471; Kelly 1932:202; DuBois 1935:87).

In California, the concept of a thunder deity was very widespread. Sacred Thunder was considered the Creator by a number of tribes, including the Cahto (Creator called *Tcenes*), Coast Yuki (*Ehlaumel*), and Maidu (*He'lin mai'du*) (Powers 1877:287; Kroeber 1925:155, 216; Myers 1978: 245; Jewell 1987:161), and the voice of a god in others, such as the Tolowa and Yuki (Foster 1944:204; Giovannetti 1989: 519). For some of the Pomo, Sacred Thunder was an angry god (*Kuksu*) talking to them (Heizer 1972:15).

THUNDER IN CALIFORNIAN MYTHOLOGY

The primary guardian spirits of Yurok warriors were the Thunders, the sons of Sacred Thunder (Buckley 1992:151-152). However, Sacred Thunder does not appear to have represented a war god to the native Californians, at least during the ethnohistoric period. Certain observations were made, though, such as the connection between stone projectile points and lightning. The Huchnom, for example, believed that obsidian blades fell from heaven and were supernatural, while the Yuki believed that the

Creator threw small "flints" to earth (Foster 1944:204, 233). The Hupa associated obsidian with the Thunders. Large obsidian blades were known by the Hupa as "Thunders' Stones," and obsidian projectile points were thought to "burn like lightning" on impact (Davis 1988:219, 221-222). In a Chumash myth, Sacred Thunder killed the *Hap* (a dangerous supernatural being) by filling its mouth with "sharp pieces of flint" (Blackburn 1975:113-114).

In California, Sacred Thunder was almost always thought of as being male (e.g., Kroeber 1907:204, 215-216; Loeb 1926:301; Driver 1936:217, 1939:343; Foster 1944:204; Fowler and Liljebland 1986:452-453; Jewell 1987:161; Merriam 1992:69). According to many of the tribes, he played an active role in pre-human times. For example, the Yurok believed that the world had originally been smooth and flat during the primeval era, but had eventually been made rough and irregular by Sacred Thunder's lightning (Kroeber 1976:169). Additionally, they believed that Sacred Thunder was responsible for the origin of the blood-money settlement, after an incident involving the death of his son (Kroeber 1976:364). Elsewhere, the Maidu thought that Sacred Thunder stole the first fire and had fathered Rain (Shipley 1991:173), while the Chumash believed that he had married Datura's (*Momoy*) granddaughter, and fathered the Thunder Twins (Applegate 1975:16). The Cahto believed that the primeval sky had been made of stone, and that *Tcenes* (Sacred Thunder) and *Nagaicho* ("Great Traveler") "fixed" it after it was shaken apart by thunder (Gifford and Block 1990:79). In a Cahto origin myth, Sacred Thunder shattered a rock with his thunderbolt (Loeb 1934a:24). According to the Mattole, thunder was a "blueish disk-shaped stone" that moved slowly across the clouds (Driver 1939:401). The Miwok, Yokuts, Chumash, and Mono believed that thunder was the sound of the Thunder Twins playing in the sky-world (Kroeber 1907:197, 204, 215-216;

Gayton 1948:279; Hudson and Underhay 1978: 142, 154). Although usually thought to have dwelled in the sky-world, Sacred Thunder also resided in terrestrial settings, such as the Yurok village of *Kenek* (Kroeber 1925:74), and at *Kenuxoitse* ("Thunder's Rock"), the Hupa rain rock in Sugar Bowl (Davis 1988:218).

There were other beliefs about thunder. For example, the Bear River and Sinkyone thought that celestial thunder was the sound of shaman spirits talking or traveling in the sky-world (Nomland 1935:170, 1938:98), and the Huchnom believed it to be the flight of an Indian's "many-winged spirit" to heaven (Powers 1877:144). The Wintu thought that it resulted from a menstruant's violation of a sacred sucker place (DuBois 1935:75). The mythologies of the Pomo and Miwok explained thunder as being caused by the rustling of bear and deer skins (Gifford 1917:291-292; Loeb 1926:301; Merriam 1993:22), and bears are associated with thunder in many of the northern Californian mythologies (e.g., Gifford 1917: 286-292; DuBois and Demetracopoulou 1931: 296-299, 308-310, 352-355; DuBois 1935:75; Zigmund 1980:72; Merriam 1993:22). In Shasta mythology, there exists some suggestion of a thunder and salmon association (Kroeber and Barrett 1960:107).

RAIN-MAKING IN CALIFORNIA

Perhaps the most common association with thunder was rain. Throughout much of California, Sacred Thunder was thought to control the rain. In certain mythologies, rain represented the offspring of Sacred Thunder (e.g., Shipley 1991:173), while in most, it was an attribute. In native California, there was much concern about the weather. The coming and going of rain was especially crucial to human subsistence and weather specialists were employed to forecast the changes in weather, and to attract or dispel rain. These "rain-makers" were often shamans with Sacred Thunder as

their ally (e.g., Voegelin 1942:153; Gayton 1948:245; Applegate 1978:22; Fowler and Liljeblad 1986:452-453; Wilson 1989:508). Among the Yokuts, for example, it was believed that whirlwinds and thunderstorms arose when a rain-shaman died (Gayton 1948:209).

Rain-makers were common in most California tribes (Kroeber 1925:854). During times of drought, or when rain was needed to bring fish upriver, the rain-maker was important to the well-being of a community.¹ As Florence Shippek (1992:91) pointed out, native Californian rain-makers were "scientists" since they "must have been highly observant of all phenomena that preceded any change in weather, and thus they could predict and with ceremony 'bring' the result."

In the drier southlands, rain-makers were usually employed to make rain, but in the wetter north, they were also often asked to stop the precipitation. Common methods of stopping rain and thunder included song and dance, and appeals made directly to the storm (Kelly 1932:202; DuBois 1935:87; Gifford and Kroeber 1937:205). More esoteric means were also used, such as striking a dog to make it howl (see Loeb 1926:318; Kroeber 1932:287; DuBois 1935:88; Gayton 1948:158; Davis 1988:107).

Although there were many ways to make it rain, most native Californian rain-making techniques appear to have fallen into four distinct but related categories: the creation of ritual thunder, clouds, wind, and rain (and perhaps lightning, too). Together, these four categories formed what might, provisionally, be called the "Western Rain-Making Process." This process was based on the belief that a rainstorm could be brought into existence by ritually creating a single aspect of the storm, be it thunder, clouds, wind, or rain. These creations served to stimulate the sky-world into providing rain, and are examples of sympathetic magic. Similar beliefs were held elsewhere (cf. Frazer 1981:13-22). For example, a similar

rain-making process was practiced in Russia.

In a village near Dorpat in Russia, when rain was much wanted, three men used to climb up the fir-trees of an old sacred grove. One of them drummed with a hammer on a kettle or small cask to imitate thunder; the second knocked two fire-brands together and made the sparks fly, to imitate lightning; and the third, who was called "the rain-maker," had a bunch of twigs with which he sprinkled water from a vessel on all sides. This is an example of sympathetic magic; the desired event is supposed to be produced by imitating it. Rain is thus made by "imitation" [Frazer 1981:13].

Furthermore, an analogy might be drawn with the European or Western tradition-based farming communities of the Midwest in the late nineteenth and early twentieth centuries. It was here that itinerant rain-makers preached, played loud music, and banged drums and washtubs in hopes of bringing rain (Lee Davis, personal communication 1992; Nancy Evans, personal communication 1992).

In native California, rain could be made by first creating "ritual rain." The simplest method was to throw water into the air, as the Pomo, Coast Miwok, and Yokuts are all known to have done (Kroeber 1925:518; Loeb 1926:318; Gayton 1948:157; Kelly 1991:485). Pomo rain-makers sometimes blew water through a kelp tube (Gifford and Kroeber 1937:201). Further north, Hupa rain-makers sprinkled water on their "rain rocks" (Goddard 1904:79-80), while the Shasta buried ice beneath warm ashes (Holt 1946:327). The introduction of ritual rain into the air or earth served to attract real rain.

It appears that rain was seldom made by creating "ritual wind." However, the ethnographic record does provide some indication of this method. For example, the Yokuts rain-maker was believed to have made rain by "blowing" (Gayton 1948:207), while a particular Wintu rain-maker was said to have made rain by "whistling" (DuBois 1935:87). Pounding cupules was thought by the Shasta to

bring wind and rain (Heizer 1953:35). Additionally, the Paiute twirled a bull-roarer in order to bring a warmer wind to melt the snow (Kelly 1932:202), and the Sinkyone used the bull-roarer for starting and stopping the wind (Driver 1939:398). The Coast Miwok, when desiring "fresh air," hung a *tcila* (charmstone) outside the door of the house (Kelly 1991:462). They also believed that wind could be made by blowing into a hole in a particular rock, or by pulverizing a special plant "whose leaves squash like water" (Kelly 1991:71, 485). It is unclear whether these other methods of creating ritual wind were intended to result in rain, or if they were undertaken only to warm or cool the air.

The creation of "ritual clouds" was also employed by rain-makers. A number of California tribes burned incense, thus creating "clouds" that meshed and reacted with the sky. The Shasta burned a certain root, and sometimes the splinters of a tree that had been hit by lightning (Dixon 1907:470-471). The Wintu also burned the splinters of such trees (DuBois 1935:87). The Patwin burned oak galls and the tule nests of diving birds (Kroeber 1932:287), and the Coast Miwok burned kelp (Kelly 1991:485). Wintu rain-makers sometimes smoked tobacco during the rain-making ritual (DuBois 1935:87), as did Yuma rain-makers, who, in addition, had large numbers of individuals run about in order to raise large dust clouds (Heizer and Elsasser 1980:56). Ritual clouds were also produced by the Pomo, who threw ashes into the air (Gifford and Kroeber 1937:201).

It was the creation of ritual thunder, however, that appears to have been of most importance in the Western Rain-Making Process. Ritual thunder consisted of various noises made to imitate the sound of celestial thunder. It was usually produced by striking one rock against another, thus producing a "rock thunder" from "thunder rocks." In the Southwest, ritual thunder was probably produced by the drumming that accompanied the various rain

dances. In California, ritual thunder was also made by using the bull-roarer.

The bull-roarer was considered to be a "thunder stick" throughout the world. For example, among the Ilahita Arapesh of New Guinea, bull-roarers were used to create auditory thunderstorms during dry-season rituals (Tuzin 1984:588). Among the Hopi, bull-roarers represented thunder, and were used to bring storms (Parsons 1939:377; Tyler 1964:101). In California, the Yuki called the bull-roarer "Thunder's Voice," and equated it with the voice of the Creator (Foster 1944:210; Hultkrantz 1979:50, citing Schmidt 1936:50). The Coast Miwok, Pomo, and Patwin also associated the bull-roarer with thunder, as did the Chemehuevi (Loeb 1926:302, 1934a:117, 1934b:224-225; Kelly 1936:137, 1991:222; Laird 1980:85). The Chemehuevi used a bull-roarer made from mountain-sheep horns for rain-making (Kelly 1936:137). The Washoe called their bull-roarer a "Thunder-stick" (d'Azevedo 1986:490). The Pomo utilized bull-roarers to imitate thunder in a ceremony they held for *Kalimatoto*, their Thunder God (Loeb 1926:390-391; Gifford and Kroeber 1937:208). The Pomo envisioned *Kalimatoto* as a man who encircled the world, swinging a sack full of clouds around his head, hence the bull-roarer imitated the sound made by the twirling sack (Loeb 1926:390). The Coast Miwok believed that rain would result if the bull-roarer was used too often in the winter (Loeb 1934a:118).

The use of thunder rocks to produce rock thunder may have been a relatively common method of rain-making in California. Heizer (1953) described a Shasta petroglyph boulder, known as the Gottville "rain rock" (cf. Dixon 1907:449). This boulder is covered with pits (cupules) and grooves, as well as several "bear paw" glyphs (see Nissen and Ritter 1986:Fig. 7). According to local residents, the Gottville boulder was used to control the weather, its pits made to bring wind and rain, and its grooves to

bring snow (Heizer 1953:35). Based on this description, it is proposed that the pits on the Gottville boulder resulted from the rock having been repeatedly pounded with a pestle or hammerstone in imitation of lightning, and that the rock thunder which resulted from this action was thought to attract rain to the area. A possible analogy is found in a Shasta creation myth. In the story, the Creator used a stone to bore a hole in the primeval sky, through which fell snow and ice, thus creating Mount Shasta (Anonymous 1972:30). The Klamath of southern Oregon and the Yakima of south-central Washington also utilized pitted boulders for bringing wind and controlling the weather (cf. Spier 1930:21; Benson and Hoskinson 1993:42-44).

In the Southwest, there is some evidence suggesting an association between pitted boulders and rain-making. At *Tunjopin*, near San Ildefonso Pueblo, an "Eyed Boulder" is incorporated into a shrine (see Scully 1989:Figs. III:63-65). This "Eyed Boulder" is a tabular outcrop on which are several bedrock mortar-like depressions and a few cupules. Another "Eyed Boulder" is located near a rain shrine at *Tsi'como*, near Santa Clara Pueblo (Scully 1989: Fig. III:39).

Additional support for the association of cupules and rain is suggested by the observation that pitted boulders in northern California and the Great Basin often have the most and largest pits on horizontal surfaces (Fig. 1) (cf. Parkman 1992:367; Stoney 1993:54). On the other hand, pitted boulders in southern California are often characterized by cupules located on vertical surfaces (Fig. 2) (cf. Smith et al. 1990:8). Parkman (1992:367) hypothesized that some of the larger horizontal cupules served as receptacles for catching rainwater, which could be used for ritual and/or practical purposes. David Grove (1987:167) presented a similar hypothesis to explain the "cup-mark stones" associated with Chalcatzingo and other Middle Formative

sites in Mesoamerica. Several sites in north-central Nevada serve as good examples of the rain-receptacle hypothesis. At the Grimes (26-Ch-3), Dunphy (26-Ev-1), and Rawhide (26-Ch-120) sites, numerous large cupules mark the horizontal surfaces of boulders, although some smaller cupules do spill over onto vertical surfaces (see Heizer and Baumhoff 1962:Plates 1a, 1c, 3a, 3b). Additionally, at the Grimes site, a unique petroglyph panel integrates rows of cupules with a rake-like element not unlike certain Puebloan rain cloud designs (cf. Mallery 1893:Fig. 1149; Fewkes 1919:Figs. 89-90; Heizer and Baumhoff 1962:Plate 2d). Although it is purely a matter of conjecture, the panel may represent rain.

In northwestern California, the use of thunder rocks may be a continuing tradition. A traditional rain rock at the Karok site of *Katimin* was re-utilized as recently as the late 1970s (Nissen and Ritter 1986:70); however, it is unclear whether thunder played a role in the usage of the rock. The Chumash have renewed their use of pitted boulders, as well (McGukian et al. 1993).

Throughout California, certain rocks, springs, and other aspects of the natural landscape were considered to be places of "power" (see Bean 1975; Jewell 1987). It is not unreasonable to assume that the people who utilized thunder rocks considered them to be imbued with power (cf. Benson and Buckskin 1992:37). The action of pounding on the boulder to imitate thunder may have released some of this power to interact with the sky-world and stimulate rainfall. The power may also have been absorbed by the rain-makers, providing empowerment to their quest, and allowing them to travel directly to the supernatural world in order to solicit rain from Sacred Thunder (Bean 1975:29). Indeed, the boulder may have been perceived as a "door" through which the shaman entered the supernatural world. The Pomo, for example, be-



Fig. 1. Pitted boulder, Modoc County, California. Photograph by Arlene Benson, c. 1987.

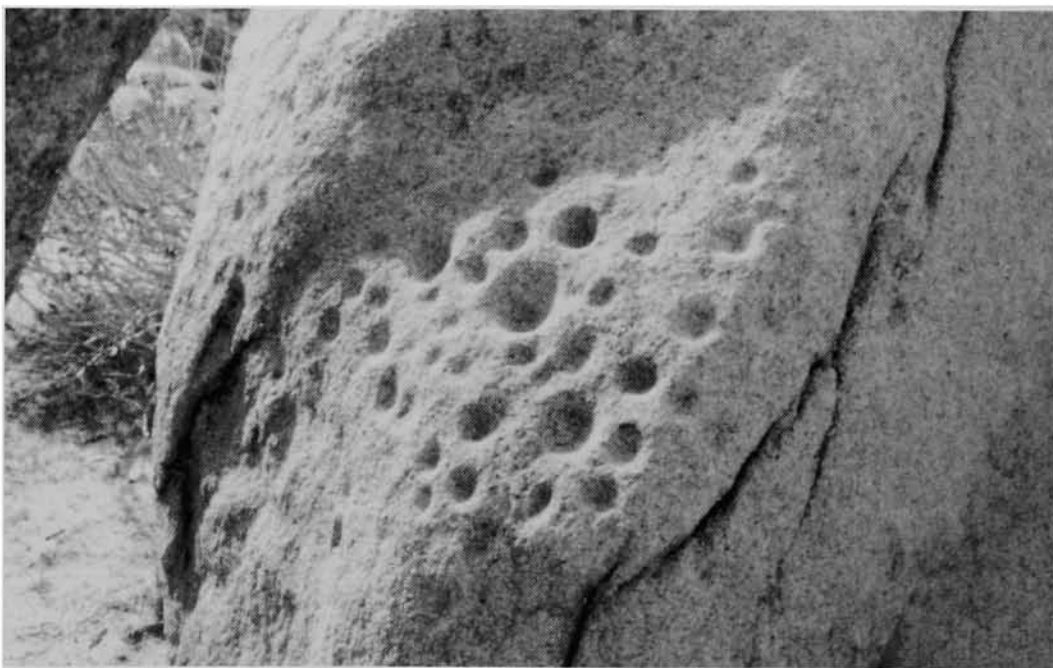


Fig. 2. Pitted boulder, San Diego County, California. Photograph by the author, 1982.

lieved that the sky-world was entered by way of a small door in a rock gate in the sky (Barrett 1933:19). In southern Oregon, a Yoncalla petroglyph boulder was considered a gate to the underworld (Loring and Loring 1983:4-5, citing Minter 1967:17, 34). The boulder's numerous grooves were possibly carved by shamans entering an altered state of consciousness (cf. Steinbring and Granzberg 1986:209-211; Meldrum 1992). Pit River shamans also used petroglyph boulders as gates to the supernatural world (Benson and Sehgal 1987:6). Yurok, Hupa, and Tolowa shamans, on the other hand, acquired power inside the *chekche?iL* ("prayer seat"), a stone structure constructed atop sacred mountains (cf. Chartkoff 1983; Buckley 1986, 1992: 134-135). Similar structures have been recorded in northeastern California and in the San Francisco Bay area (cf. Benson and Buckskin 1991:56; Parkman n.d.a). Additionally, Yokuts rain-makers kept their paraphernalia in special rocks.

. . . a rain shaman kept his outfit within a large rock. He would talk to the rock, which would open so he could get his things. Each doctor had his own place; his things would be in a basket set in a hole in the rock which he had created by means of his power. The opening thereto was not palpable to others [Gayton 1948:207].

To stop rain, the Gottville boulder was covered, indicating that the Shasta believed that the surface of the thunder rock interacted directly with the sky-world (Heizer 1953:35). A similar belief was held by the Kashaya Pomo, who observed certain rules when grinding food in a stone mortar: "It was believed that grinding should be done under a brush shelter or else it would bring rain; the booming noise made by the pestle was associated with thunder, the first sign of rain" (Alvarez and Peri 1987: 12). The Kashaya perceived the sound (rock thunder) of the percussion made by the pestle striking the mortar as following an invisible course from the earth to the sky where, if

allowed, it would interact with the sky and cause rain. The course, and the movement of sound along it, was similar to what might be thought of as "inverse lightning." Among the Pima of Arizona, the shaman's ladder to the sky-world was known as the "zigzag ladder" (Russell 1908:339). For the Kashaya, rain could be avoided by blocking the ascent of the sound by constructing a brush shelter over the grinding area. As mentioned earlier, the effect of the Gottville rain rock was negated by covering (or burying) it.

A second type of thunder rock is recorded for the Pomo. The people of Clear Lake utilized a "rocking stone" in order to make it rain (Gifford and Kroeber 1937:201). The exact manner of its operation was not recorded, but a rock-against-rock arrangement is not unlikely. Similarly, Grant (1967:31) noted that on the Twana Reservation in Washington, there is a petroglyph boulder with a thunderbird carved on it which, if shaken, is thought to cause rain.

Rock thunder was created in other ways. For example, Cahto rain-makers are reported to have rolled large rocks down the sides of mountains (Driver 1939:421), and Benson and Buckskin (1991:58) reported that an Achumawi informant compared thunder to the sound of boulders rolling down a mountainside. Similarly, in a Western Mono myth, Sacred Thunder threw and rolled stones at an adversary (Gayton and Newman 1940:49). In the Southwest, at Acoma Pueblo, stone balls were rolled about in order to create thunder and lightning (Parsons 1939: 981). The Zuni rolled stone balls, or clashed them together, in their Rain Chief ritual, and attributed the sound of the balls to thunder (Parsons 1939:378). At Santa Clara Pueblo, two stone projectile points were clashed together to create thunder, while at Isleta Pueblo, stone balls were used to send thunder and lightning against an enemy (Parsons 1939:378).

In Tolowa country, rain-makers threw pebbles at "rain rocks," while reciting prayers

(Drucker 1937:229). Exotic pebbles are often found in archaeological sites and, like charmstones, occasionally accompanied the deceased to their graves (cf. Parkman 1990). Some of these burial-associated pebbles may represent thunder stones, as may quartz crystals. In the Southwest, for example, two quartz crystals were rubbed together to make a spark, and were called "lightning stones" (Tyler 1964:183).

Rain-makers also used charmstones (cf. Henshaw 1885; Latta 1949:201, 204; Heizer 1955:152). Among the Chumash and some Tatic groups, rain was made by sprinkling charmstones with water (ritual rain), and then violently smashing them together (cf. Henshaw 1885; Grant 1966:67-68; Hudson and Blackburn 1978:239). Chumash mythology associated Sacred Thunder with the *sopo* (charmstone) (Blackburn 1975:223-224, 272-273, 343). The Chumash *tokoy*, or stone disk, was also associated with Sacred Thunder, and it was probably also used by rain-makers (cf. Blackburn 1975:105; Grant 1978:Fig. 3). In his discussion of the Chumash Sun Festival held at winter solstice, Librado (1981:57) described the use of a sunstick stone that suggests an association with ritual thunder and rain. Like the Chumash, Yokuts rain-makers used charmstones (cf. Latta 1949:208), as did the Southern Salinan, Miwok, Mono, and Cahuilla (Gifford MS:21; Kroeber 1925:549; Gayton 1948:248; Bean 1972:145). Salinan shamans stopped thunder by pointing their "amulets" (probably charmstones) at the sky (Mason 1912:185). In northern California, the Patwin called their charmstones *k'imir* ("thunders"), and believed that they were little thunders that had fallen from the sky (Kroeber 1932:287).²

Thus, in native California, charmstones, pitted boulders, and pebbles were all used to make rain. Of course, the common element of these rain-making methods was the rock thunder produced by one rock striking another. It is conceivable that many of the pitted boulders

found in California (and elsewhere in western North America) were thunder rocks, utilized by rain-makers to create ritual thunder. An association between shamanism, rain-making, and rock art can be demonstrated for Numic groups in western North America, as seen in the recent work of Whitley (n.d.a, n.d.b, n.d.c). It is likely, then, that many of California's pitted boulders were shamanistic tools used to make rain. Many of the battered charmstones found in California's archaeological sites may have had a similar function (e.g., Gerow with Force 1968:77, 79; Bickel 1981:247).

Shamans were almost certainly responsible for much of California's rock art (cf. Hedges 1992; Whitley n.d.a, n.d.b, n.d.c, n.d.d, n.d.e, 1992a, 1992b). The shamanic experience often involved a transition from one reality to another, via the entrance into an altered state of consciousness (Bean and Vane 1992:13-15; Whitley 1992a:107-108, 1992b:86). In south-central California, entrance into the Land of the Dead required passing between two large "clashing rocks" (cf. Gayton and Newman 1940:19, 102; Blackburn 1975:99; Zigmund 1980:177). The clashing rocks served as an analog to the aural hallucinations that occur at the beginning of an altered state of consciousness, and they served to demarcate sacred and profane space (David S. Whitley, personal communication 1993). Thunder was an important aspect of shamanism for this same reason. Its sound helped demarcate the sacred and profane, and the ritual and mundane. For example, when ascending into the upper world, the Altaic shaman of Siberia beat his drum in imitation of celestial thunder and lightning (Eliade 1964:194-195). Also in Siberia, the Yakut shaman went so far as to animate his drum by constructing it of wood from lightning-struck trees (Eliade 1964:170). Frazer (1981:19) described a Buddhist rain-making ceremony in Siam, in which a "wild music," consisting of a "din of drums and cymbals and crackers," symbolized the

storm. Likewise, while recounting a boyhood experience in which the Thunders visited him during a trance, Black Elk, an Oglala Sioux holy man, associated celestial thunder with the sound of drumming: "I looked up at the clouds, and two men were coming there, head-first like arrows slanting down; and as they came, they sang a sacred song and the thunder was like drumming" (Neihardt 1979:19).³ Thus, drumming may be seen as an analog to thunder.

In Siberia and elsewhere, drums were often utilized by shamans to create a liminal zone, and thus a relationship is thought to exist between percussion and transition (cf. Neher 1962; Needham 1967b; Freeman 1968). It seems possible, then, that in native California some thunder rocks took the place of shamanistic drums for use in liminal rites (cf. Van Gennep 1960:21). In other words, the use of certain pitted boulders by native Californian rain-makers may have involved the attainment of altered states of consciousness through the rhythm, sound repetition, repetitive muscle use, and sheer exhaustion brought on by repeatedly pounding the boulder with a pestle or hammerstone (cf. Meldrum 1992; Parkman n.d.b, 1993a). In this altered state, the individual could have communicated directly with the supernatural, thus assuring greater success in his or her quest (Bean and Vane 1992:13-15). Eliade (1964:173, 175, 1991:46-47) demonstrated a relationship between shamans, drums, and altered states of consciousness. In light of this observation, it is proposed that some of the pitted boulders may have served as *stone drums*, on whose percussion one flew to the supernatural world in search of Sacred Thunder and rain.⁴

There is limited evidence that suggests a considerable antiquity for certain aspects of the Western Rain-Making Process. For example, charmstones were relatively common in central California beginning about 4,500 B.P. with the

Windmill Pattern (cf. Heizer 1949; Ragir 1972; Moratto 1984:201-207, 552). Perhaps even more important is the hypothesized antiquity of cupule occurrences. Pitted boulders are part of the so-called "Pit-and-Groove Style" (Baumhoff et al. 1958:15; Heizer and Baumhoff 1962:208-209), and are generally believed to be the oldest form of rock art in the Americas (cf. Grant 1967:152; Elsasser 1976:16; Grieder 1982:37; Schaafsma 1986:215).⁵ Heizer and Baumhoff (1962:234) estimated the beginning of this style at 7,000-5,000 B.P.⁶ Parkman (1992) proposed a Pitted Boulder Tradition for Hokan-speaking populations, and estimated that this style began at least as early as 9,000-7,000 B.P. with the Western Pluvial Lakes Tradition (Bedwell 1973) of the Great Basin. It was also proposed that pitted boulders appeared in California with the arrival of proto-Hokan groups (Parkman 1992, 1993b:359, 362). A hypothesized association between pitted boulders and Hokan populations has been suggested by others (cf. Baumhoff and Orlins 1979:199; Baumhoff 1980:181; Breschini et al. 1983:410; Nissen and Ritter 1986:72). Other Californian groups, especially the Penutians, are thought to have utilized such boulders as well (cf. Foster et al. 1990; Ritter and Parkman 1992). Parkman (1992:367) hypothesized that the earliest pitted boulders were associated with rituals involving rain, a use that is thought to have continued until historic times, as evidenced by the Gottville and *Katimin* rain rocks.⁷ Pitted boulders may have been utilized in rituals that sought to create ritual thunder as early as 7,000-9,000 years ago. The Western Rain-Making Process may thus explain the origin of the Pitted Boulder Tradition in western North America.

CONCLUSIONS

Native Californian mythologies indicate that the personification of celestial thunder was widespread. Sacred Thunder was occasionally considered the supreme deity but was more

often perceived as being secondary to the Creator. Although sometimes considered an antagonist, Sacred Thunder was usually looked upon favorably.⁸ His tremendous power was both feared and revered. In order to bring the blessing of his rain, rain-makers sought to ritually create an aspect of the storm, be it thunder, cloud, wind, or rain. The ethnographic record indicates that these rain-making activities were conducted throughout western North America and elsewhere in the world. However, while the ritual creation of clouds, wind, and rain was practiced by rain-makers elsewhere, the creation of ritual thunder, especially rock thunder, appears to have been particularly prevalent in California, where it may have been used by shamans in achieving altered states of consciousness. The creation of rock thunder, then, is hypothesized as the primary aspect of the Western Rain-Making Process proposed in this paper.

NOTES

1. In northern California, rain-making activities appear to have been primarily associated with world renewal and fishing. By late summer, sand bars had developed at the mouths and along many rivers and streams, impeding the movement of salmon. Sufficient rainfall was needed to remove these barriers if the salmon were to move upstream to the awaiting fishermen. An association appears to exist between pitted boulders, rain-making, and fishing (Nissen and Ritter 1986:72). It is likely that the rain/fish model explains many of the pitted boulder occurrences in northern California, and along the Northwest Coast and the Columbia Plateau, as well (cf. Hill and Hill 1974:198-199, 248; Keyser 1992:74).

2. Artifacts of polished and tapered stone have been attributed to thunder elsewhere in the world (cf. Courlander 1960:14, 21, Plate 22; Freeman 1968:357; MacKenzie 1985:2).

3. In Black Elk's account of the *Heyoka* ceremony, the thunderstorm appeared to serve as a metaphor for the altered state of consciousness associated with the vision quest:

Only those who have had visions of the thunder beings of the west can act as heyokas. They have sacred power and they share some of this

with all the people, but they do it through funny actions. When a vision comes from the thunder beings of the west, it comes with terror like a thunder storm; but when the storm of vision has passed, the world is greener and happier; for wherever the truth of vision comes upon the world, it is like rain. The world, you see, is happier after the terror of the storm [Neihardt 1979:188].

4. By "stone drum," I do not wish to imply that these pitted boulders resonate when struck. Although some rocks do emit a bell-like sound (cf. Latta 1949:196-197; Lanning 1958; Jackson et al. 1965; Montage 1965; Blades 1970:81-82; Minor 1975:15; Knight 1979; Hedges 1990:80; Smith et al. 1990:8; Hart and Lieberman 1991:31; Steinbring 1992:103-105), most do not have acoustic properties. Indeed, as True and Baumhoff (1981:260) have pointed out, most pitted boulders do not ring when struck, but rather make a "very dull thud." The kind of resonance of which I envision these "stone drums" being capable is one of internal rather than external effect, a result of infrasonic waves having an emotional effect on the brain (cf. Freeman 1968; Tuzin 1984). Mickey Hart, the Grateful Dead drummer-turned-ethnomusicologist, described the internal effect that drumming has on the drummer:

In the beginning was noise, and noise begat rhythm, and rhythm begat everything else. When the rhythm is right you feel it with all your senses. The head of the drum vibrates as the stick strikes it. The physical feedback is almost instantaneous, rushing along your arms, filling your ears. Your mind is turned off, your judgement wholly emotional. Your emotions seem to stream down your arms and legs and out the mouth of the drum; you feel light, gravity-less, your arms feel like feathers. You fly like a bird [Hart 1990:231].

It is this effect, which, when supplemented with sensory deprivation, may have led to the altered states of consciousness to which I am referring (cf. Meldrum 1992). Stone drumming, then, may have resulted in the same kind of trance-state realized by drumming (and dancing) in ceremonies such as the Ghost and Sun dances of the American Plains (cf. Mooney 1965:42, 156, 181, 187-188, 224; Jorgensen 1972:19, 192, 214; Jilek 1982:326).

5. As a style name, "Pit-and-Groove" is a misnomer. Most occurrences consist of pitted boulders without grooves, and thus the style (if one exists) is actually "pit-and/or-groove" in nature.

6. Cupules are thought to represent human-kind's earliest known symbolic expression, dating to at least 40,000 B.P. in France, and perhaps even earlier in India (Giedion 1962:132-136; Bednarik et al. 1991:34; Robert G. Bednarik, personal communication 1993). While Heizer and Baumhoff (1962:234) proposed 7,000-5,000 B.P. as the date at which the so-called "Pit-and-Groove Style" petroglyphs first appeared in the Great Basin, recent findings by Dorn and Whitley (1983) and Whitley and Dorn (1987, 1988) suggested that petroglyph styles thought to postdate the Pit-and-Groove Style are much older than thought (see Guidon and Delibrias 1986). Cation-ratio dating of desert varnish on Great Basin petroglyphs has resulted in five petroglyphs being dated in excess of 11,500 B.P., including one representational element (a bighorn sheep) which has been dated at 18,200 B.P. (Whitley and Dorn 1988:412-413). Similar results have been obtained in Australia (cf. Dorn et al. 1988; Nobbs and Dorn 1988). Although the cation-ratio dating method is generally considered a viable technique, the degree of its validity and interpretation has yet to be fully determined (cf. Dorn 1990). However, the findings do suggest that the "Pit-and-Groove Style" may be older than or contemporaneous (at a very early time depth) with other rock art styles formerly presumed to postdate it. Given the sophistication of their Palaeolithic contemporaries in Europe in executing rock art such as that found at Lascaux and Altamira (cf. Leroi-Gourhan 1967:Plates 72-73, 112), it is quite conceivable that the first migrants to the New World carried with them the knowledge and ability to create various rock art styles (David S. Whitley, personal communication 1993). The cation-ratio dating method offers promise in investigating that possibility.

7. Joseph Mountjoy (1987) proposed an association between pitted boulders and rain in western Mexico. In California, I (Parkman 1992) have hypothesized two other primary utilizations of pitted boulders in addition to their use as "rain rocks": (1) "work rocks" used by girls undergoing puberty rites associated with the "Work Complex" identified by Driver (1941:51) (i.e., the initiates pounded the cupule pits in order to symbolize the grinding of vegetal foods, and to demonstrate their willingness to work hard) (cf. Teit 1900:317-320; Gifford 1926:29-30); and (2) "baby rocks," represented by the ethnographic Pomo examples, and limited to north-central California and Chumash territory (cf. Loeb 1926:247-248; Barrett 1952:386-387; Payen 1966:82-86; Fleshman 1975; Hedges 1983). Numerous other explanations have been offered for cupule occur-

rences, including uses as diverse as offering receptacles, mortuary markers, and star charts (cf. Payen 1966, 1968; Minor 1975; True and Baumhoff 1981; Parkman n.d.c, 1983, 1986, 1988, 1991; Nissen and Ritter 1986; Benson and Buckskin 1987, 1992; Foster et al. 1990; Smith et al. 1990; Ritter and Parkman 1992). Given the simplistic and universal nature of cupule manufacture, it is likely that these petroglyphs were created for (*intentional cupule*) and as a result of (*incidental cupule*) various activities. However, I believe that many of the California cupule occurrences fall into one of the three primary categories of rain, work, and baby rocks, and thus represent incidental markings. Therefore, these cupules should be viewed as rock "features" rather than rock "art."

8. It appears that thunder was viewed more favorably by those groups living in areas where thunder was relatively rare. For example, the Tolowa, Yuki, and Pomo perceived thunder as being the "voice of God" (Foster 1944:204; Heizer 1972: 15; Giovannetti 1989:519). In California, thunder occurs primarily in the late spring and early and late summer, and is much less frequent along the coast than in the mountainous interior (cf. Gilliam 1962: 25, 62-63; Bailey 1966:67). In the thunder-prone interior, native groups took a more neutral or even negative view of thunder, often perceiving it as a malevolent spirit (cf. Powers 1877:287; Merriam 1993:69-70, 83). We might conclude from this that native people did not want to consider thunder an angry god in those lands where thunder was abundant, otherwise their god would have seemed to be constantly angry with them. Likewise, in lands of abundant thunder, personal injury from lightning strikes was a real danger, thus adding to the malevolent image of thunder. It is unclear whether any correlation exists between the frequency of pitted boulders and thunder. Pitted boulders occur in much of coastal California, where thunder is relatively rare. However, pitted boulders are also found in areas of abundant thunder (cf. Nissen and Ritter 1986; Ritter and Parkman 1992), albeit in what appears to be slightly smaller numbers.

ACKNOWLEDGEMENTS

This is a revised version of a paper entitled "Creating Thunder: California Indian Rain-Making Traditions," read at the Eighth Annual California Indian Conference, October 16-18, 1992, University of California, Berkeley. I thank Diane Askew, Robert Bednarik, Arlene Benson, Lee Davis, Nancy Evans, and Paul Peterson for their assistance during the preparation of this paper. I also thank David S.

Whitley and one of the anonymous reviewers for their critical and thorough reading of this paper. Any errors, however, are the sole responsibility of the author.

REFERENCES

- Alvarez, Susan H., and David W. Peri
1987 Acorns: The Staff of Life. *News from Native California* 1(4):10-14.
- Anonymous
1972 Legends Told by the Old People. Invermere, BC: Good Medicine Books.
- Applegate, Richard B.
1975 The Datura Cult Among the Chumash. *The Journal of California Anthropology* 2(1):7-17.
1978 ?Atishwin: The Dream Helper in South-Central California. Ballena Press Anthropological Papers No. 13.
- Ashby, Gene
1989 Never and Always: Micronesian Legends, Fables and Folklore. Pohnpei, F.S.M.: Rainy Day Press.
- Bailey, Harry P.
1966 Weather of Southern California. Berkeley: University of California Press.
- Barrett, Samuel A.
1933 Pomo Myths. *Bulletin of the Public Museum of the City of Milwaukee* 15.
1952 Material Aspects of Pomo Culture. *Bulletin of the Public Museum of the City of Milwaukee* 20(1-2).
- Baumhoff, M. A.
1980 The Evolution of Pomo Society. *Journal of California and Great Basin Anthropology* 2(2):175-185.
- Baumhoff, M. A., Robert F. Heizer, and Albert E. Elsasser
1958 Lagomarsino Petroglyph Group (Site 26-St-1) near Virginia City, Nevada. Berkeley: University of California Archaeological Survey Report No. 43 (Part 2):1-17.
- Baumhoff, M. A., and Robert I. Orlins
1979 An Archaeological Assay on Dry Creek, Sonoma County, California. Berkeley: University of California Archaeological Research Facility Contribution No. 40.
- Bean, Lowell J.
1972 Mukat's People. Berkeley: University of California Press.
- 1975 Power and Its Application in Native California. *The Journal of California Anthropology* 2(1):25-33.
- Bean, Lowell J., and Sylvia Brakke Vane
1992 The Shamanic Experience. In: *California Indian Shamanism*, Lowell John Bean, ed., pp. 7-19. Menlo Park, CA: Ballena Press.
- Bednarik, R. G., G. Kumar, and G. S. Tyagi
1991 Petroglyphs from Central India. *Rock Art Research* 8(1):33-35.
- Bedwell, Stephen F.
1973 Fort Rock Basin: Prehistory and Environment. Eugene: University of Oregon Books.
- Benedict, Ruth
1969 Zuni Mythology, Vol. II. New York: AMS Press.
- Benson, Arlene, and Floyd Buckskin
1987 How the Seasons Began: An Ajumawi Narrative Involving Sun, Moon, North Star, and South Star. *Griffith Observer* 51(7):2-11, 15.
1991 Magnetic Anomalies at Petroglyph Lake. In: *Rock Art Papers*, Vol. 8, Ken Hedges, ed., pp. 53-64. San Diego: San Diego Museum of Man.
1992 Achomawi Jumping Rocks and the Concept of the Test. In: *American Indian Rock Art*, Vol. 15, Kay K. Sanger, ed., pp. 31-38. San Miguel, CA: American Rock Art Research Association.
- Benson, Arlene, and Tom Hoskinson
1993 Transformations: Preparing the Land. In: *American Indian Rock Art*, Vol. 12, William D. Hyder, ed., pp. 37-46. San Miguel, CA: American Rock Art Research Association.
- Benson, Arlene, and Linda Sehgal
1987 The Light at the End of the Tunnel. In: *Rock Art Papers*, Vol. 5, Ken Hedges, ed., pp. 1-16. San Diego: San Diego Museum of Man.
- Bickel, Polly McW.
1981 San Francisco Bay Archaeology: Sites Ala-328, Ala-13 and Ala-12. Berkeley: Contributions of the University of California Archaeological Research Facility Number 43.
- Blackburn, Thomas C.
1975 December's Child: A Book of Chumash

- Oral Narratives. Berkeley: University of California Press.
- Blades, James
1970 *Percussion Instruments and Their History*. New York: Frederick A. Praeger.
- Blinkenberg, C. H. R.
1911 *The Thunderweapon in Religion and Folklore*. Cambridge: Cambridge University Press.
- Breschini, Gary S., Trudy Haversat, and R. Paul Hampson
1983 *A Cultural Resources Overview of the Coast and Coast-Valley Study Areas*. Report on file at the Northwest Archaeological Information Center, Sonoma State University.
- Brown, Joseph Epes
1971 *The Sacred Pipe*. Baltimore: Penguin Books.
- Buckley, Thomas
1986 *Lexical Transcription and Archaeological Interpretation: A Rock Feature Complex from Northwestern California*. *American Antiquity* 51(3):617-618.
1992 *Yurok Doctors and the Concept of "Shamanism."* In: *California Indian Shamanism*, Lowell John Bean, ed., pp. 117-161. Menlo Park, CA: Ballena Press.
- Chartkoff, Joseph L.
1983 *A Rock Feature Complex from Northwestern California*. *American Antiquity* 48(4):745-760.
- Courlander, Harold
1960 *The Drum and the Hoe: Life and Lore of the Haitian People*. Berkeley: University of California Press.
1975 *A Treasury of African Folklore*. New York: Crown Publishers, Inc.
- Davis, Lee
1988 *On This Earth: Hupa Land Domains, Images and Ecology on 'Deddeh Ninnisan.'* Ph.D. dissertation, University of California, Berkeley.
- d'Azevedo, Warren L.
1986 *Washoe*. In: *Handbook of North American Indians*, Vol. 11, Great Basin, Warren L. d'Azevedo, ed., pp. 466-498. Washington: Smithsonian Institution.
- Dixon, Roland B.
1907 *The Shasta*. *Bulletin of the American Museum of Natural History* 17(5):381-498.
- Dorn, Ronald I.
1990 *Rock Varnish Dating of Rock Art: State of the Art Perspective*. *La Pintura* 17(2): 1-2, 9-11.
- Dorn, Ronald I., and David S. Whitley
1983 *Cation-Ratio Dating of Petroglyphs from the Western Great Basin, North America*. *Nature* 302(5911):816-818.
- Dorn, Ronald I., Margaret Nobbs, and T. A. Cahill
1988 *Cation-Ratio Dating of Rock Engravings from the Olary Province of Arid South Australia*. *Antiquity* 62(4):681-689.
- Driver, Harold E.
1936 *Wappo Ethnography*. University of California Publications in American Archaeology and Ethnology 36(3).
1939 *Culture Element Distributions: X: Northwest California*. *University of California Anthropological Records* 1(6).
1941 *Culture Element Distributions: XVI: Girls' Puberty Rites in Western North America*. *University of California Anthropological Records* 6(2).
- Drucker, Philip
1937 *The Tolowa and Their Southwest Oregon Kin*. University of California Publications in American Archaeology and Ethnology 36(4).
- DuBois, Cora
1935 *Wintu Ethnography*. University of California Publications in American Archaeology and Ethnology 36(1).
- DuBois, Cora, and Dorothy Demetracopoulou
1931 *Wintu Myths*. University of California Publications in American Archaeology and Ethnology 28(5).
- Eliade, Mircea
1958 *Patterns in Comparative Religion*. London: Sheed and Ward.
1964 *Shamanism: Archaic Techniques of Ecstasy*. Bollingen Series LXXVI. Princeton: Princeton University Press.
1991 *Images and Symbols*. Princeton: Princeton University Press.
- Elsasser, Albert B.
1976 *Rock Art on Three Continents*. *Pacific Discovery* 29(2):15-20.
- Fewkes, Jesse Walter
1919 *Designs on Prehistoric Hopi Pottery*. Bureau of American Ethnology Annual Report 33:207-284.

- Fleshman, Georgia Lee
1975 Pit and Groove Rocks and Cupules in San Luis Obispo County. In: Papers on the Chumash, pp. 89-115. San Luis Obispo County Archaeological Society Paper No. 9.
- Foster, Daniel G., Richard C. Jenkins, and John Betts
1990 Rock Art in the Coalinga Backcountry. In: Rock Art Papers, Vol. 7, Ken Hedges, ed., pp. 53-68. San Diego: San Diego Museum of Man.
- Foster, George M.
1944 A Summary of Yuki Culture. University of California Anthropological Records 5(3).
- Fowler, Catherine S., and Sven Liljebld
1986 Northern Paiute. In: Handbook of North American Indians, Vol. 11, Great Basin, Warren L. d'Azevedo, ed., pp. 435-465. Washington: Smithsonian Institution.
- Frazer, James G.
1981 The Golden Bough. New York: Avenal Books. [First published in 1890.]
- Freeman, Derek
1968 Thunder, Blood, and the Nicknaming of God's Creatures. Psychoanalytic Quarterly 37(3):353-399.
- Gayton, Anna H.
1948 Yokuts and Western Mono Ethnography II: Northern Foothill Yokuts and Western Mono. University of California Anthropological Records 10(2).
- Gayton, Anna H., and Stanley S. Newman
1940 Yokuts and Western Mono Myths. University of California Anthropological Records 5(1).
- Gerow, B. A., with R. W. Force
1968 An Analysis of the University Village Complex with a Reappraisal of Central California Archaeology. Stanford: Stanford University Press.
- Giedion, S.
1962 The Eternal Present: The Beginnings of Art. Bollingen Series XXXV.6.1. New York: Bollingen Foundation.
- Gifford, Edward Winslow
MS Southern Miwok Ceremonies. MS No. 181, on file at the Phoebe Apperson Hearst Museum of Anthropology, University Archives, University of California, Berkeley.
- 1917 Miwok Myths. University of California Publications in American Archaeology and Ethnology 12(8).
- 1926 Clear Lake Pomo Society. University of California Publications in American Archaeology and Ethnology 18(2).
- Gifford, Edward W., and Gwendoline Harris Block
1990 Californian Indian Nights. Lincoln: University of Nebraska Press. [First published in 1930.]
- Gifford, Edward W., and Alfred L. Kroeber
1937 Culture Element Distributions: IV: Pomo. University of California Publications in American Archaeology and Ethnology 37(4).
- Gilliam, Harold
1962 Weather of the San Francisco Bay Region. Berkeley: University of California Press.
- Giovannetti, Joseph M.
1989 Using Depth Psychology Constructs to Accurately Interpret Native Symbolism: An Examination of the Tolowa "Catching the White Bird" Myth. The American Indian Quarterly 13(4):511-527.
- Goddard, Pliny Earle
1904 Life and Culture of the Hupa. University of California Publications in American Archaeology and Ethnology 1(1).
- Grant, Campbell
1966 The Rock Paintings of the Chumash. Berkeley: University of California Press.
- 1967 Rock Art of the American Indian. New York: Thomas Y. Crowell Company.
- 1978 Inland Chumash. In: Handbook of North American Indians, Vol. 8, California, Robert F. Heizer, ed., pp. 524-529. Washington: Smithsonian Institution.
- Grieder, Terence
1982 Origins of Pre-Columbian Art. Austin: University of Texas Press.
- Grove, David C.
1987 Miscellaneous Bedrock and Boulder Carvings. In: Ancient Chalcatzingo, David C. Grove, ed., pp. 159-170. Austin: University of Texas Press.
- Guidon, N., and G. Delibrias
1986 Carbon-14 Dates Point to Man in the Americas 32,000 Years Ago. Nature 321 (6072):769-771.

- Harrod, Howard L.
1987 *Renewing the World: Plains Indian Religion and Mortality*. Tucson: University of Arizona Press.
- Hart, Mickey
1990 *Drumming on the Edge of Magic*. New York: Harper Collins.
- Hart Mickey, and Fredric Lieberman
1991 *Planet Drum*. New York: Harper Collins.
- Hedges, Ken
1983 A Re-Examination of Pomo Baby Rocks. In: *American Indian Rock Art*, Vol. 9, Frank G. Bock, ed., pp. 10-21. El Toro, CA: American Rock Art Research Association.
1990 Petroglyphs in Menifee Valley. In: *Rock Art Papers*, Vol. 7, Ken Hedges, ed., pp. 75-82. San Diego: San Diego Museum of Man.
1992 Shamanistic Aspects of California Rock Art. In: *California Indian Shamanism*, Lowell John Bean, ed., pp. 67-88. Menlo Park, CA: Ballena Press.
- Heizer, Robert F.
1949 *The Archaeology of Central California, I: The Early Horizon*. University of California Anthropological Records 12(1).
1953 *Sacred Rain-Rocks of Northern California*. Berkeley: University of California Archaeological Survey Reports 22:33-38.
1955 *California Indian Linguistic Records: The Mission Indian Vocabularies of H. W. Henshaw*. University of California Anthropological Records 15(2).
1972 *George Gibb's Journal of Redick McKee's Expedition through Northwestern California in 1851*. Berkeley: University of California, Archaeological Research Facility.
- Heizer, Robert F., and Martin A. Baumhoff
1962 *Prehistoric Rock Art of Nevada and Eastern California*. Berkeley: University of California Press.
- Heizer, Robert F., and Albert B. Elsasser
1980 *The Natural World of the California Indians*. Berkeley: University of California Press.
- Henshaw, Henry W.
1885 The Aboriginal Relics Called "Sinkers" or "Plummets." *American Journal of Archaeology* 1(1):105-114.
- Hill, Beth, and Ray Hill
1974 *Indian Petroglyphs of the Pacific Northwest*. Seattle: University of Washington Press.
- Holt, Catherine
1946 *Shasta Ethnography*. University of California Anthropological Records 3(4).
- Hoskinson, Tom
1990 Lightning Strikes Incorporated into Southwestern Gila River Rock Art Designs. In: *Rock Art Papers*, Vol. 7, Ken Hedges, ed., pp. 103-109. San Diego: San Diego Museum of Man.
- Hudson, Travis, and Thomas C. Blackburn
1978 The Integration of Myth and Ritual in South-Central California: The "Northern Complex." *The Journal of California Anthropology* 5(2):225-250.
- Hudson, Travis, and Ernest Underhay
1978 *Crystals in the Sky: An Intellectual Odyssey Involving Chumash Astronomy, Cosmology and Rock Art*. Ballena Press Anthropological Papers No. 10.
- Hultkrantz, Ake
1979 *The Religion of the American Indians*. New York: Facts On File.
- Jackson, G., J. S. Gartlan, and M. Posnansky
1965 Rock Gongs and Associated Rock Paintings on Lolui Island, Lake Victoria, Uganda: A Preliminary Note. *Man* 5(1):38-40.
- Jewell, Donald P.
1987 *Indians of the Feather River: Tales and Legends of Concow Maidu of California*. Menlo Park, CA: Ballena Press.
- Jilek, W. G.
1982 Altered States of Consciousness in North American Indian Ceremonials. *Ethos* 10 (3):326-343.
- Jorgensen, Joseph G.
1972 *The Sun Dance Religion*. Chicago: University of Chicago Press.
- Kelly, Isabel
1932 *Ethnography of the Surprise Valley Paiute*. University of California Publications in American Archaeology and Ethnology 31(3).
1936 Chemehuevi Shamanism. In: *Essays in Anthropology*, presented to A. L. Kroeber in Celebration of His Sixtieth Birthday, pp. 129-142. Berkeley: University of California Press.

- 1991 Interviews with Tom Smith and Maria Copa: Isabel Kelly's Ethnographic Notes on the Coast Miwok Indians of Marin and Sonoma Counties, California. San Rafael, CA: Miwok Archaeological Preserve of Marin.
- Keyser, James D.
1992 Indian Rock Art of the Columbia Plateau. Seattle: University of Washington Press.
- Knight, Lavinia C.
1979 Bell Rock and Indian Maze Rock of Orange County. Pacific Coast Archaeological Society Quarterly 15(2):25-32.
- Kroeber, Alfred L.
1907 Indian Myths of South Central California. University of California Publications in American Archaeology and Ethnology 4(4).
1925 Handbook of the Indians of California. Bureau of American Ethnology Bulletin 78.
1932 The Patwin and their Neighbors. University of California Publications in American Archaeology and Ethnology 29(4).
1976 Yurok Myths. Berkeley: University of California Press.
- Kroeber, Albert L., and S. A. Barrett
1960 Fishing Among the Indians of Northwestern California. University of California Anthropological Records 21(1).
- Laird, Carobeth
1980 Chemehuevi Shamanism, Sorcery, and Charms. Journal of California and Great Basin Anthropology 2(1):80-87.
- Lanning, E. C.
1958 A Ringing Rock Associated with Rain-Making, Uganda. The South African Archaeological Bulletin 13(1):83-84.
- Latta, Frank F.
1949 Handbook of Yokuts Indians. Oildale, CA: Bear State Books.
- Leroi-Gourhan, Andre
1967 Treasures of Prehistoric Art. New York: Harry N. Abrams.
- Lévi-Strauss, Claude
1966 The Savage Mind. Chicago: University of Chicago Press.
- Librado, Fernando
1981 The Eye of the Flute. Banning, CA: Malki Museum Press.
- Loeb, Edwin M.
1926 Pomo Folkways. University of California Publications in American Archaeology and Ethnology 19(2).
1934a The Western Kuksu Cult. University of California Publications in American Archaeology and Ethnology 33(1).
1934b The Eastern Kuksu Cult. University of California Publications in American Archaeology and Ethnology 33(2).
- Loring, J. Malcolm, and Louise Loring
1983 Pictographs and Petroglyphs of the Oregon Country. Part II: Southern Oregon. University of California, Los Angeles, Institute of Archaeology, Monograph 23.
- Lummis, Charles F.
1992 Pueblo Indian Folk-Stories. Lincoln: University of Nebraska Press. [First published in 1910.]
- MacKenzie, Donald A.
1985 India. New York: Avenal Books.
- Mails, Thomas
1973 Dog Soldiers, Bear Men and Buffalo Women: A Study of the Societies and Cults of the Plains Indians. Englewood Cliffs, NJ: Prentice-Hall.
- Mallery, Garrick
1893 Picture-Writing of the American Indians. Bureau of American Ethnology Annual Report 10:1-822.
- Mason, J. Alden
1912 The Ethnography of the Salinan Indians. University of California Publications in American Archaeology and Ethnology 10(4).
- McGukian, Peggy, Alvan McLain, and C. William Clewlow, Jr.
1993 Northern Nevada Cupule Sites. Paper presented at the annual meeting of the American Rock Art Research Association, Reno.
- Meldrum, Marjorie H.
1992 Archaeology of the Mind: Rhythmics and Certain Elemental Petroglyph Forms. In: Ancient Images, Ancient Thought: The Archaeology of Ideology, A. Sean Goldsmith, Sandra Garvie, David Selin, and Jeannette Smith, eds., pp. 347-356. Calgary: Archaeological Association, University of Calgary.

- Merriam, C. Hart
 1992 *The Dawn of the World: Myths and Tales of the Mewok Indians of California*. Lincoln: University of Nebraska Press. [First published in 1910 as *Dawn of the World: Myths and Weird Tales Told by the Mewan Indians of California*.]
 1993 *Annikadel: The History of the Universe as Told by the Achumawi Indians of California*. Tucson: University of Arizona Press. [First published in 1928 as *Annikadel: The History of the Universe as Told by the Mo-des-se Indians of California*.]
- Michelson, Truman
 1929 *Observations on the Thunder Dance of the Bear Gens of the Fox Indians*. Bureau of American Ethnology Bulletin 89.
- Minor, Rick
 1975 *The Pit-and-Groove Petroglyph Style in Southern California*. San Diego Museum of Man, Ethnic Technology Notes No. 15.
- Minter, Harold A.
 1967 *Umpqua Valley, Oregon and Its Pioneers, the History of a River and Its People*. Portland: Binford and Mort.
- Montage, Jeremy
 1965 *What is a Gong?* *Man* 5(1):18-21.
- Mooney, James
 1965 *The Ghost-Dance Religion*. Chicago: University of Chicago Press. [First published in 1896 as Part 2 of the Fourteenth Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, 1892-93. Washington.]
- Moratto, Michael J.
 1984 *California Archaeology*. Orlando: Academic Press.
- Mountjoy, Joseph B.
 1987 *Antiquity, Interpretation, and Stylistic Evolution of Petroglyphs in West Mexico*. *American Antiquity* 52(1):161-174.
- Myers, James E.
 1978 *Cahto*. In: *Handbook of North American Indians*, Vol. 8, California, Robert F. Heizer, ed., pp. 244-248. Washington: Smithsonian Institution.
- Needham, Rodney
 1967a *Blood, Thunder, and Mockery of Animals*. In: *Myth and Cosmos*, John Middleton, ed., pp. 271-285. Austin: University of Texas Press.
- 1967b *Percussion and Transition*. *Man* 2(4): 606-614.
- Neher, Andrew
 1962 *A Physiological Explanation of Unusual Behavior in Ceremonies Involving Drums*. *Human Biology* 34(2):151-160.
- Neihardt, John G.
 1979 *Black Elk Speaks*. Lincoln: University of Nebraska Press.
- Nissen, Karen M., and Eric W. Ritter
 1986 *Cupped Rock Art in North-Central California: Hypothesis Regarding Age and Social/Ecological Context*. In: *American Indian Rock Art*, Vol. 11, William D. Hyder, Helen Crotty, Kay Sanger, and Frank Bock, eds., pp. 59-75. El Toro, CA: American Rock Art Research Association.
- Nobbs, Margaret F., and Ronald I. Dorn
 1988 *Age Determinations for Rock Varnish Formation Within Petroglyphs: Cation-Ratio Dating of 24 Motifs from the Olary Region, South Australia*. *Rock Art Research* 5(2):108-126, 139-146.
- Nomland, Gladys Ayer
 1935 *Sinkyone Notes*. University of California Publications in American Archaeology and Ethnology 36(2).
 1938 *Bear River Ethnography*. University of California Anthropological Records 2(2).
- Parkman, E. Breck
 n.d.a *A Theoretical Consideration of the Bedrock Milling Station*. In: *The Ohlone: New Interpretations*, Lowell John Bean, ed. Menlo Park, CA: Ballena Press (in press).
 n.d.b *Lungumari Puntilla: A Cupule Petroglyph Occurrence on the South Coast of Peru*. In: *American Indian Rock Art*, Vol. 20, Frank G. Bock, ed. San Miguel, CA: American Rock Art Research Association (in press).
 n.d.c *California Dreamin': Cupule Petroglyph Occurrences in the American West*. In: *Proceedings of the Americas Symposium*, Jack Steinbring, ed. Oxford: Oxbow Press (in press).
- 1983 *Soapstone for the Cosmos: Archaeological Discoveries in the Cuyamaca*

- Mountains. *Journal of California and Great Basin Anthropology* 5(1-2):140-155.
- 1986 Cupule Petroglyphs in the Diablo Range, California. *Journal of California and Great Basin Anthropology* 8(2):246-259.
- 1988 Further Notes on Cupule Petroglyphs in the Diablo Range, California. *Journal of California and Great Basin Anthropology* 10(1):114-117.
- 1990 A Fist Full of Pebbles: Geological Curios in Archaeological Context. *Pacific Coast Archaeological Society Quarterly* 26(4): 51-61.
- 1991 A Statement Concerning Cupule Petroglyphs. In: *Papers on California Prehistory 3*, Gary Breschini and Trudy Haversat, eds., pp. 18-25. Coyote Press Archives of California Prehistory No. 33.
- 1992 Toward a Proto-Hokan Ideology. In: *Ancient Images, Ancient Thought: The Archaeology of Ideology*, A. Sean Goldsmith, Sandra Garvie, David Selin, and Jeannette Smith, eds., pp. 365-370. Calgary: Archaeological Association, University of Calgary.
- 1993a Observations Concerning the Herschel Site, and Other Rock Art Occurrences in Southwestern Saskatchewan, and Adjacent Alberta, Canada. Report on file at the Department of Anthropology, University of Winnipeg, Winnipeg, Manitoba.
- 1993b The PCN-Style Petroglyph. In: *There Grows a Green Tree: Papers in Honor of David A. Fredrickson, Greg White, Pat Mikkelsen, William R. Hildebrandt, and Mark E. Basgall*, eds., pp. 351-366. Davis: Center for Archaeological Research at Davis Publication No. 11.
- Parsons, Elsie Clews
1939 *Pueblo Indian Religion*. Chicago: University of Chicago Press.
- Payen, Louis A.
1966 *Prehistoric Rock Art in the Northern Sierra Nevada, California*. Master's thesis, Sacramento State College.
1968 A Note on Cupule Sculptures in Exogene Caves from the Sierra Nevada, California. *Caves and Karst* 10(4):33-39.
- Powers, Stephen
1877 *Tribes of California*. Contributions to North American Ethnology 3. Washington: U. S. Geographical and Geological Survey of the Rocky Mountain Region.
- Ragir, Sonia R.
1972 *The Early Horizon in Central California Prehistory*. Berkeley: Contributions of the University of California Archaeological Research Facility No. 15.
- Ritter, Eric W., and E. Breck Parkman
1992 *Rock Art of the Northern Sierra Nevada-Southern Cascade Range Interface*. In: *American Indian Rock Art*, Vol. 18, Frank G. Bock, ed., pp. 81-104. San Miguel, CA: American Rock Art Research Association.
- Russell, Frank
1908 *The Pima Indians*. Twenty-sixth Annual Report of the Bureau of American Ethnology to the Secretary of the Smithsonian Institution, 1904-05, pp. 3-389. Washington: Government Printing Office.
- Schaafsma, Polly
1986 *Rock Art*. In: *Handbook of North American Indians*, Vol. 11, Great Basin, Warren L. d'Azevedo, ed., pp. 215-226. Washington: Smithsonian Institution.
- Schmidt, W.
1936 *Donner und Regenbogen beim Hochsten Wesen der Yuki*. In: *Essays in Anthropology Presented to A. L. Kroeber*, R. H. Lowie, ed., pp. 299-308. Berkeley: University of California Press.
- Scully, Vincent
1989 *Pueblo: Mountain, Village, Dance*. Chicago: University of Chicago Press.
- Shipek, Florence
1992 *The Shaman: Priest, Doctor, Scientist*. In: *California Indian Shamanism*, Lowell John Bean, ed., pp. 89-96. Menlo Park, CA: Ballena Press.
- Shiple, William
1991 *The Maidu Indian Myths and Stories of Hanc'ibyjim*. Berkeley: Heyday Books.
- Smith, Gerald A., Michael K. Lerch, and Harley Garbani
1990 *Indian Pit and Groove Petroglyphs Cupules of Western Riverside County*. San Jacinto, CA: San Jacinto Valley Museum Association and Inland Empire Museum Foundation.
- Spence, Lewis
1914 *The Myths of the North American Indians*. London: George G. Harrap & Company.

- Spier, Leslie
1930 Klamath Ethnography. University of California Publications in American Archaeology and Ethnology 30.
- Steinbring, Jack
1992 Phenomenal Attributes: Site Selection Factors in Rock Art. In: American Indian Rock Art, Vol. 17, Donald E. Weaver, Jr., ed., pp. 102-113. El Toro, CA: American Rock Art Research Association.
- Steinbring, Jack, and Gary Granzberg
1986 Ideological and Cosmological Inferences from North American Rock Art: An Exploratory Discussion. In: Rock Art Papers, Vol. 3, Ken Hedges, ed., pp. 207-220. San Diego: San Diego Museum of Man.
- Stoney, Stephen A.
1993 Cupule Rock Art in Southern Nevada: An Analysis. In: American Indian Rock Art, Vol. 19, Frank G. Bock, ed., pp. 49-56. San Miguel, CA: American Rock Art Research Association.
- Teit, James
1898 Traditions of the Thompson River Indians of British Columbia. Memoirs of the American Folk-Lore Society 4.
1900 The Thompson Indians of British Columbia. Memoir of the American Museum of Natural History 2(4).
- True, D. L., and M. A. Baumhoff
1981 Pitted Rock Petroglyphs in Southern California. Journal of California and Great Basin Anthropology 3(2):257-268.
- Tuzin, Donald
1984 Miraculous Voices: The Auditory Experiences of Numinous Objects. Current Anthropology 25(5):579-597.
- Tyler, Hamilton A.
1964 Pueblo Gods and Myths. Norman: University of Oklahoma Press.
- Van Gennep, Arnold
1960 The Rites of Passage. Chicago: University of Chicago Press.
- Voegelin, Ermine W.
1942 Culture Element Distributions: XX: Northeast California. University of California Anthropological Records 7(2).
- Welch, David
1982 Aboriginal Rock Art of Kakadu National Park, Northern Territory of Australia. Darwin: Big Country Picture Company.
- Whitley, David S.
n.d.a By the Hunter, for the Gatherer: Art, Social Relations and Subsistence Change in the Prehistoric Great Basin. World Archaeology 25(3):356-373 (in press).
n.d.b The Numic Vision Quest: Ritual and Rock Art in Far Western North America. In: Numic Myth and Reality, D. Myers, ed. (in preparation).
n.d.c To Kill a Mountain Sheep: Art, Myth and Social Relations in the Great Basin. In: New Directions in Rock Art Research, J. D. Lewis-Williams, ed. Cambridge: Cambridge University Press (in preparation).
n.d.d Shamanism, Natural Modeling and the Rock Art of Far Western North American Hunter-Gatherers. In: Rock Art and Shamanism, Solveig Turpin, ed. San Antonio: Rock Art Foundation (in press).
n.d.e Ethnography and Rock Art in the Far West: Some Archaeological Implications. In: New Light on Old Art: Recent Advances in Hunter-Gatherer Rock Art Research, D. S. Whitley and L. L. Loendorf, eds. Institute of Archaeology, University of California, Los Angeles, Monograph 36 (in press).
- 1992a Shamanism and Rock Art in Far Western North America. Cambridge Archaeological Journal 2(1):89-113.
1992b Prehistory and Post-Positivist Science: A Prolegomenon to Cognitive Archaeology. In: Archaeological Method and Theory, Vol. 4, M. B. Schiffer, ed., pp. 57-100. Tucson: University of Arizona Press.
- Whitley, David S., and Ronald I. Dorn
1987 Rock Art Chronology in Eastern California. World Archaeology 19(2):150-164.
1988 Cation-Ratio Dating of Petroglyphs Using PIXE. Nuclear Instruments and Methods in Physics Research B35:410-414. Amsterdam: North-Holland Physics Publishing Division.
- Willcox, A.
1963 The Rock Art of South Africa. Johannesburg: Thomas Nelson and Sons.
- Wilson, Darryl
1989 Jema-Halo Ti-Wi-Ji (Great White Owl). The American Indian Quarterly 13(4): 497-509.

Wormington, H. Marie, and Richard G. Forbis
1965 An Introduction to the Archaeology of
Alberta, Canada. Denver Museum of
Natural History Proceedings No. 11.

Zigmond, Maurice L.
1980 Kawaiisu Mythology: An Oral Tradition
of South-Central California. Ballena
Press Anthropological Papers No. 18.

