Volume 48 Number 186 2003

A Test for Shamanic Trance in Central Montana Rock Art

Mavis Greer and John Greer

plains
ANTHROPOLOGIST

A Test for Shamanic Trance in Central Montana Rock Art

Mavis Greer and John Greer

ABSTRACT

Pictographs believed to result from shamanic trance activities occur in some central Montana rock art sites. Symbolic self-portraits of shamans, with identification based on ethnographic analogy, are considered the most basic artistic evidence of shamanism. However, when attempting to infer shamanistic activity from rock art, it is necessary to test function with as many models as possible. Pictographs in Dillinger Cave (24CA346) in central Montana have been broadly classified as ceremonial based on setting and figure analogy. Figures at this cave serve as selectively the best test case in central Montana for the Neuropsychological Model of Lewis-Williams and Dowson (1988), which focuses on identifying kinds of figures that might be drawn during trance. Analysis indicates that Dillinger Cave figures resemble images created during an altered state of consciousness, supporting the shamanistic function of the art. However, concordance with the model does not establish that elements were drawn during trance, explain why or how trance may have been entered, or indicate cultural meaning of the drawings.

Keywords: rock art, pictographs, shamanism, Montana, northern Plains

Based on ethnographic evidence, rock art sites in many areas of the world are attributed to being associated with the practice of shamanism (e.g., Lewis-Williams 1983; Lewis-Williams and Dowson 1988; Reichel-Dolmatoff 1975, 1987; Whitley 2001). The shamanistic explanation for American and Canadian rock art gained ground during the 1970s and 1980s (Wellmann 1979) with writings focused on this topic from California (Hedges 1976, 1983, 1985) and the American southwest (Cole 1989) east to Ontario (Vastokas and Vastokas 1973), and from the northern Plains (Keyser 1979, Sundstrom 1989) to southern Texas (Shafer 1986). Thus, by the 1990s shamanism had become an accepted function for many rock art sites throughout North America (e.g., Jones 1990; Keyser 1990; Loendorf 1994; Turpin 1994; Whitley 1992, 1994). Recently arguments have been put forth that entire rock art traditions are associated with shamanism, such as the Dinwoody Tradition of western Wyoming (Francis and Loendorf 2002) and the California and the Great Basin Traditions (Whitley 2000).

The assumed association between rock art and shamanism has been part of Montana rock art literature since the late 1970s, when it was suggested that some sites in the central part of the state were painted in conjunction with shamanistic practices (Keyser 1979). This initial suggestion by Keyser for central Montana became more accepted with the expansion of the regional database (M. Greer 1995; Greer and Greer 1993, 1994; Keyser and Klassen 2001). The first shaman-function assignments were based only on figure analogy. Later, sites along the Smith River in central Montana were analyzed in greater detail using site function models based on diagnostic characteristics of setting and figure context to classify sites into such broad categories as *ceremonial*, which subsumed shamanism (M. Greer 1995). Based on this work, Dillinger Cave (24CA346) in central Montana (Figure 1) was found to fit the ceremonial function category. Among all central Montana ceremonial sites, Dillinger Cave is unique in appearance from a distance, in formation, and most importantly in the kinds of figures it contains. It is dominated by geo-

Mavis Greer, Greer Services, 2599 So. Paradise Drive, Casper, WY 82604

John Greer, Greer Services, 2599 So. Paradise Drive, Casper, WY 82604

Plains Anthropologist, Vol. 48, No. 186, pp. 105-120, 2003

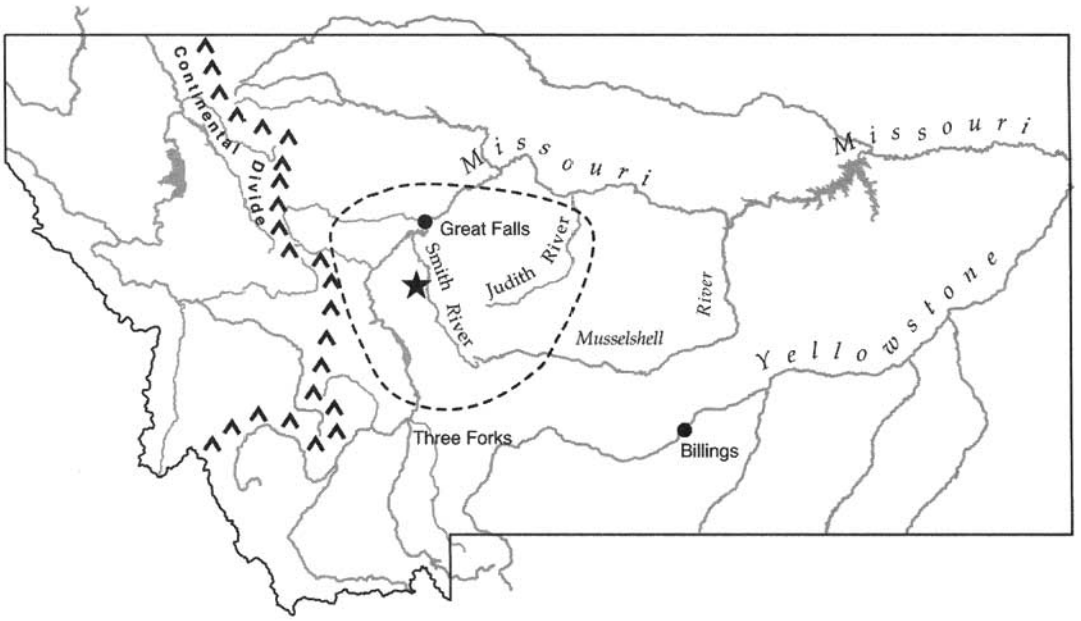

Figure 1. Location of Dillinger Cave (star) in the central Montana study area (outlined).

metrically oriented figures that recur throughout the cave and are assumed to be indicators of shamanistic association (Clottes and Lewis-Williams 1998:14-19). Therefore, because all analogical comparisons and model testing suggest this cave as the best candidate in the region for a shamanistic function, Dillinger Cave was selected for more in-depth analysis to refine further the kind of associated ceremonial use.

In order to test specifically for shamanism at Dillinger Cave, we turned to the Neuropsychological Model as presented by Lewis-Williams and Dowson (1988:202-204). The model focuses on identifying kinds of figures drawn during trance, with specific images that occur in trance initially established through ethnographic work with the San tribe in South Africa where shamans were known to paint particular images. These images, and to a certain extent the concepts, follow those earlier identified by Reichel-Dolmatoff (1971, 1975, 1978, 1987) in South America. Further extension of these ideas suggest that drawings made during trance tend to be the same forms, drawn in the same sequence, and with minimal cultural variation, thus supporting a biological foundation for basic imagery. Such explanation would mean that the model is applicable worldwide. Therefore, it was hypothesized that if the Dillinger Cave figures were consistent with forms expected to occur during different stages of trance, as outlined in the model, this would add support to the shamanistic explanation within the overall ceremonial context of the site.

SHAMAN BACKGROUND

The term *shaman* comes to English from the Tungus of Siberia via Russian, but the experiences and practices known as shamanism are present in cultures worldwide, are diverse, and have a long time depth (Edwards 1995). Shamanism is a religious expression present in many hunter-gatherer groups, the kinds of organizations that occupied prehistoric central Montana. The shaman has a direct relationship with spirit powers (Park 1938) and may have a particular specialty such as general healing, specific healing, control over fire, or wind, or other kinds of interaction between the people and the supernatural. However, a distinguishing characteristic of shamans is a trance state in which the soul leaves the body in flight and ascends to the heavens or descends into the underworld (Eliade 1964:5). Shamans, viewed as beings able to transform themselves through trance, were rec-

ognized in Plains Indian societies as something more than human and respected for their difference, although this did not give them superiority over other members of the group (Irwin 1994:72-73). Across cultures shamans were not the only people in their group to enter trances or have these out-of-body experiences (J. Greer 1995; Irwin 1994; Reichel-Dolmatoff 1978, 1987), but others doing so generally were not recognized by the group as being in a position of authority to preside over religious ceremonies or healings in order to benefit the society as a whole (Irwin 1994). For purposes of this paper, we assume shaman characteristics, as mentioned above, to be associated only with shamans, although this clearly is not the case.

Ethnographic and historic records document that people of the northern Plains and Rocky Mountains practiced shamanism (Denig 1930:422-424; Loendorf 1994; Teit 1930; Wissler 1912:270), but there are no known accounts of shamans who produced rock art in central Montana. Even if such records existed, they would not necessarily pertain to Dillinger Cave, which appears to predate most historic and present-day tribes in the area. Certainly it pre-dates the 1730 (Ewers 1955) introduction of the horse into Montana, as indicated by the lack of horses, guns, and biographic scenes not only at Dillinger but also throughout most of the Smith River drainage. An argument has been made that liquid paint pictographs in the region essentially ended before the Protohistoric Period (M. Greer 1995). Although shamanic portrayals in Montana rock art are drawn by different cultures over a long period of time, these kinds of figures appear to be most prolific in the central part of the state, and the most elaborate figures probably are associated with Besant and Avonlea cultures dating between A.D. 500 and 1100 based on seriation analysis (M. Greer 1995). Therefore, methods of analysis other than ethnographic are necessary to ascertain whether pictographs functioned in a shamanic context at Dillinger Cave.

SITE SELECTION

Dillinger Cave is one of 68 sites used in a previous study of Smith River drainage rock art, one of the goals of which was the identification of site function (M. Greer 1995). Sites were examined in terms of three models of broad-category function defined as *ceremonial* (any activities associated with the supernatural including shamanism), *marker* (announcing a message to those who see it), and *event record* (biographic accounts of a tribe, person, place, or thing). These models do not represent all possible rock art functions for any area, but they represent the main activities known to have occurred on the northern Plains and therefore have a high probability of occurring in the Smith River drainage. Function determination in that study focuses on analysis of several combinations of site setting and content attributes, and although an attempt is made to identify a function for each site, explanatory models infer function for only 30 sites (44 percent) of the 68 total in the study area (M. Greer 1995:249).

Of the 30 sites for which function is suggested, only one-third appear to fit the ceremonial model. Within that model it appears that most pictographs were probably associated with shamanism, but even if it were the only function within the ceremonial model (and it is not), it would mean that shamanism does not account for even half the rock art sites studied in the Smith River area (M. Greer 1995:252). However, of the available sites, Dillinger Cave is by far the best example of pictographs that appear to fit the shamanistic model based on information from ethnohistorical accounts, ethnographic records, ethno-archeological observations, and oral history; and, therefore, Dillinger was selected for the Neuropsychological Model test. We wanted to test a site for which shamanistic function had already been suggested by other means in order to support or refute previous results and to evaluate the test itself. In order for models to be used independently to infer site function they must be shown to work in situations where they can be verified, or at least supported, by other information. The Neuropsychological Model, presumed to be applicable in other parts of the world, specifically lowland South America and South Africa, may also be useful in suggesting site function and infer a shamanistic correlation when no evidence exists from other sources.

DILLINGER CAVE SETTING AND FIGURES

Dillinger Cave is a solution cavity in a limestone exposure high above the Smith River (Fig-

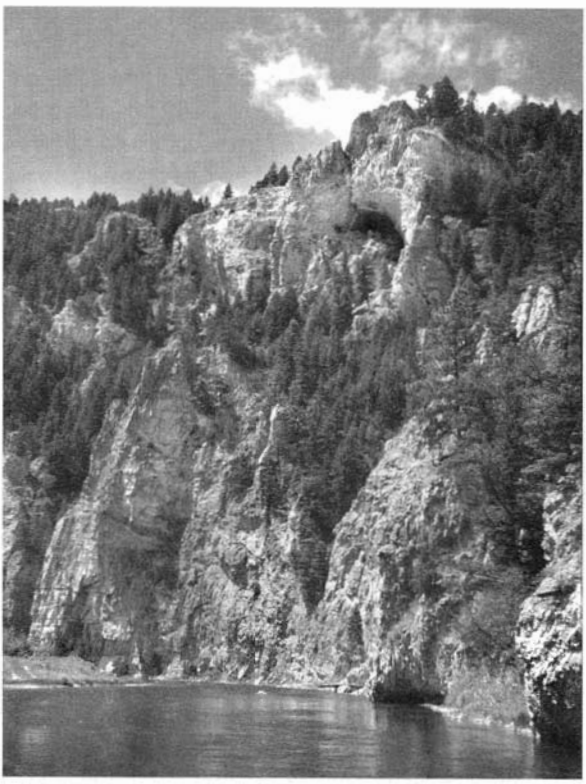

Figure 2. Dillinger Cave (24CA346).

ure 2). Entrance to the open room is made by scaling a steep 70-foot rocky wall of breakdown blocks. The room is 20 feet wide and 10 feet high, narrowing to eight feet wide at the back of the cave. The room extends out along the south wall for an additional 15 feet to the entrance lip. Pictographs are on the back wall, on limestone projections hanging from the ceiling, in ceiling indentations, and on fallen boulders on the enclosed side of the upper room entrance. No figures are in the main, lower shelter entrance below the climb. Most figures are near the back of the upper room on hanging ceiling projections that come down within four feet of the floor. Between projections the ceiling rises to six feet or more, which allows most average-sized people to stand comfortably while painting or viewing the projection in front of them (Figure 3).

There are 137 separate figures in the cave (Table 1). Some complex figures (such as four large shield-body humans) contain symbols that are counted separately only when found alone (such as triangles, squares, and dots). Figures consist mostly of geometric designs and individual symbols, with relatively few human and animal forms. Almost all paintings are in various shades of red, with only one orange figure and one in yellow. There are only two occurrences of superpositioning. One involves a dark red triangle, with a dark red square on top, painted over six light red fingerlines. In the second case of overlap, dark reddish-purple fingerlines are on top of light

Figure 3. Dillinger Cave interior.

Table 1. Figure types in Dillinger Cave.

Anthropomorphs		Zoomorphs, Hoofprints		Composites		Other	
Kind	**No.**	**Kind**	**No.**	**Kind**	**No.**	**Kind**	**No.**
looped limbed	2	bird	1	human-bird	1	mask	2
shield-body	4	turtle	12	human-turtle	1	fingerlines	16
grid-body	1	hoof print set	1			smear	4
headdress	1					triangle	18
headdress, arms raised	1					triangle with central dot	8
headless, V-neck	1					picnic-table triangle	6
stick figure	3					square	7
						square with central dot	1
						cross	6
						dot	2
						dumbbells	4
						abstract geometric shield	3
						abstract (circles, lines)	6
						geometric design (see Table 2)	25
TOTAL FIGURES 137							

red crossed lines in a tree-like design. Based on the limited variation in paint colors, deterioration, and figure styles it appears that all figures were painted by no more than a single generation. It is possible that most were painted by a single person but probably not during a single painting episode.

Single geometric images and composite designs comprised of several geometric images dominate the figures at the site. Triangles are the most common geometric form and occur alone, as part of simple designs (including eight triangles with single central dots), and as parts of more elaborate designs. A distinctive geometric portrayal involving the triangle has bottom lines extending out to resemble a small picnic table (Figure 4). Fingerlines and smears, the most common figure classes in central Montana (M. Greer 1995; Greer and Greer 1996), are underrepresented at Dillinger Cave, with only two formal smears and 16 fingerlines, all occurring as individual items. The 26 itemized geometric designs (Table 2) also include combinations of the lines, dots, squares, and triangles to form nonnaturalistic complex figures (Figure 5).

Although not as numerous as geometrics, composite human depictions are the most striking figures in the cave. The most elaborate anthropo-

Figure 4. Triangle picnic-table form.

Table 2. Geometric designs in Dillinger Cave.

Geometric Designs	
Kind	**No.**
crossed lines	1
horizontal line with three vertical lines beneath	6
circle with dot	1
circle with line	2
circle, lines, dot	3
half-circle, lines, dot	1
trapezoid with lines	1
stylized triangle (arrow like)	1
triangle with circle	1
triangle with lines	7
triangle, squares, lines	1
triangle, square, lines, dot	1
TOTAL	**26**

morphs are two large shield-body figures, the largest of which is particularly noteworthy in both its completeness and its prominent position within the cave (Figures 6-7). The shields are made of triangles, squares, and dots. The half-circle heads are capped with rayed headdresses, and their bottoms are a complex abstract arrangement. Two other abstract shield-body figures also appear to be humans based on the similarity of overall body design. All four are assumed to be shamans based on their headdresses, large geometric shields, lack of weaponry, and their context, in terms of setting and associated figures. Shamans reportedly used shields to protect them on their journey to the other world during trances (Barry 1991:46-47), and these figures seem to portray such attire. Other anthropomorphic paintings include two stick humans with looped limbs and a human with an elaborate headdress and upraised arms, a pose often associated with spirituality in rock art (Barry 1991:51-52). A headless human with a V-necked body is next to a human with a rayed headdress (Figure 8). A grid-body human (Figure 9) is unique to central Montana, but grid designs are not uncommon in trance rock art.

The zoomorphs are also unusual for this part of central Montana. Twelve of the thirteen animals here are turtles (Figure 10), and the only other animal is a sway-backed bird (Figure 11). The single set of hoof prints is recognizable as such, but they are clearly among figures with which they are not normally associated in northern Plains rock art, which more commonly are other hoof prints (Keyser and Klassen 2001:179). Images near the hoof print set include a stick figure with looped limbs, four picnic-table triangles, two squares, and three designs in the shape of dumbbells.

Figure 5. Composite geometric design.

Figure 6. Main shield-body shaman. Example of Stage 3 from Dillinger Cave showing shield body filled with a grid composed of basic entoptic patterns that occur in the cave. Enhanced photo.

Only two figures are human-animal composites. One appears to be a combined turtle-human, and the other seems to be a bird-human combination. These suggest that composites were integral to the function of rock art in this cave and not incidental to the figure assemblage.

Figures in Dillinger Cave are mostly small and unobtrusive. They do not call out to people entering the cave but rather are well integrated into the uneven hanging ceiling, walls, and rocks. Many are difficult to find or relocate, even with diligent searching. This high canyon wall setting, overlooking the river far below and separated from it by steep to almost vertical slopes, provides an ideal place for private ritualistic behavior.

SHAMAN SELF PORTRAITS

In previous examinations of rock art figures in central Montana for shamanistic characteristics, we looked at symbolic, presumed self-portraits of shamans and other possible shaman-associated figures, including powerlines, bears, bow-shaped animals, and depictions of transformation and flying (Greer and Greer 1993, 1994). Shaman self-portraits are presently considered one of the most recognizable indicators of shamanistic rock art (Barry 1991:28). Identification of human figures as shamans relies on ethnographic analogy. Early photographs and painted portraits, such as a Blackfoot

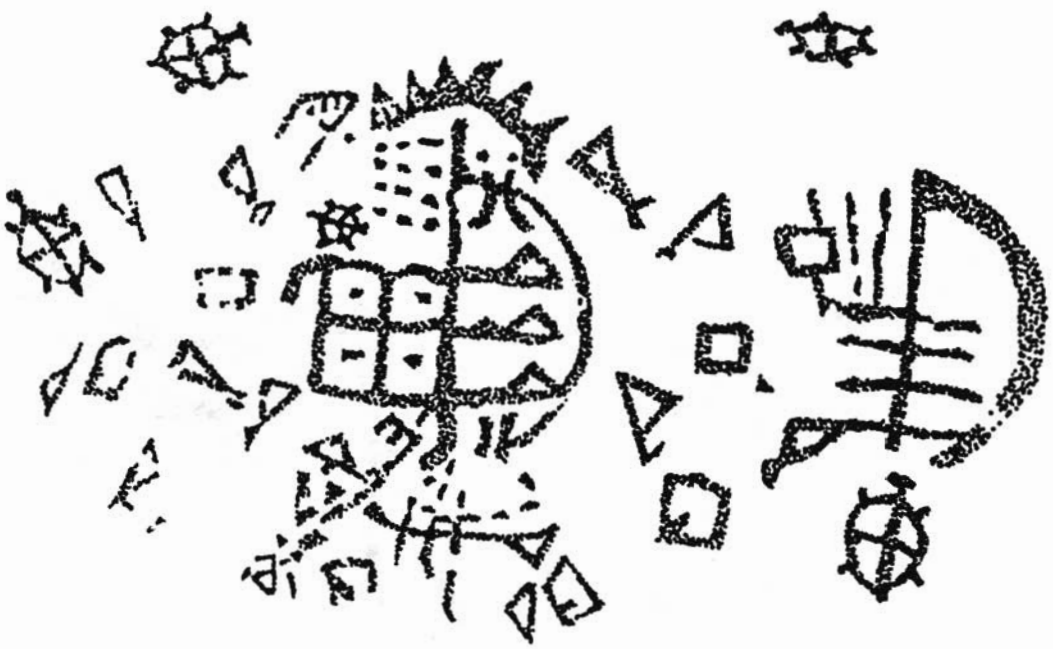

Figure 7. Main shield body shaman and surrounding figures (sketch by Keyser from Greer slide).

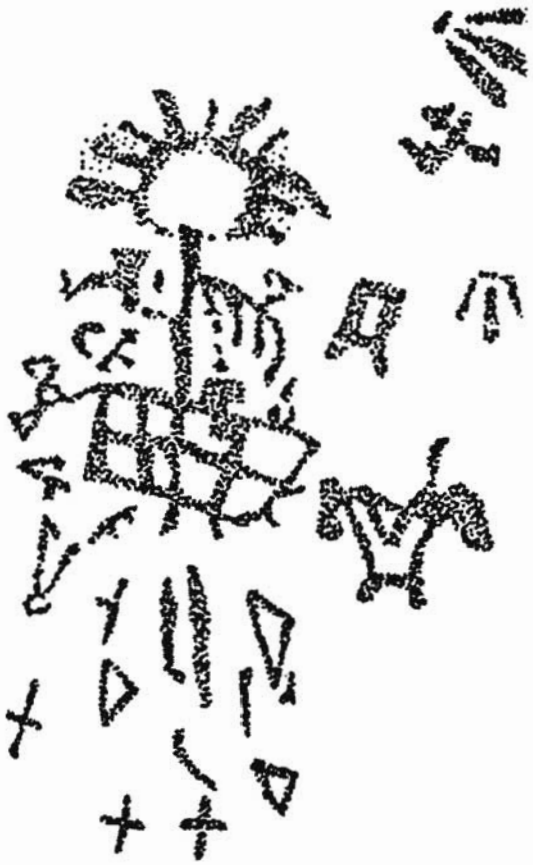

Figure 8. Ray-headdress human and surrounding figures (sketch by Keyser from Greer slide).

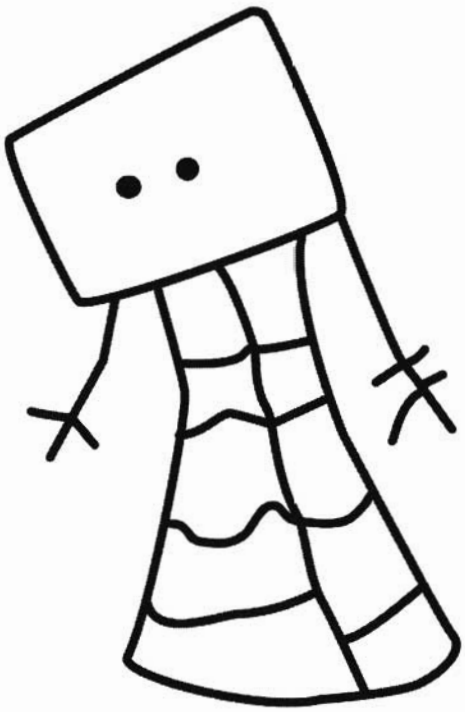

Figure 9. Grid-body human.

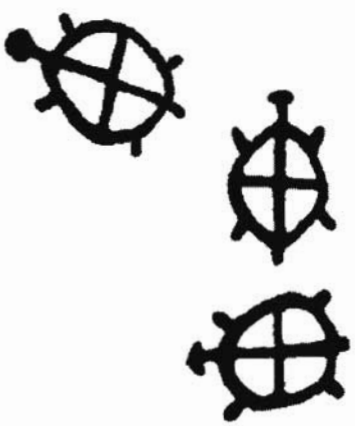

Figure 10. Turtles. Example of Stage 2 representational forms from Dillinger Cave showing replicated and rotated figures.

Figure 11. Sway-backed bird.

bear-shaman painted in the 1830s by Catlin during a trip up the Missouri, have been important in understanding shaman attire on the northern Plains (Catlin 1860; Ewers 1982:39). Shamans in northern Plains art are currently recognized by such attributes as headdresses or horns, arm positions, body adornment, missing body parts, positions indicating flight, and associated figures such as powerlines, grizzly bears, and turtles. Portrayals vary within and between sites and range from different kinds of simple stick-figure humans adorned with at least one of the above attributes, to elaborately stylized anthropomorphs with many of the shaman-defining attributes, and some with combined animal characteristics.

Shaman figures occur in different site settings, although most of those recorded in Montana are in the central limestone mountain ranges, in cave rooms high (about 100-200 feet) above the canyon floor (M. Greer 1995). In Indian Cave (24CA347), for example, just downstream from Dillinger, a variety of shaman figures are clustered on a large pictograph panel with paintings from several time periods. Shamans, both single figures and integrated groups of figures, occur in different kinds of scenes within central Montana.

Self-portraits usually are painted in a function-defining context. At Rainbow Bear Cave (24ME340), on a tributary channel upstream from Dillinger, a human holds a staff in one hand and is surrounded by a powerline attached to a large grizzly on one side and several figures across the entire width of the cave on the other. The main shaman in nearby Triangle Cave (24ME42) is 45 feet from the cave's small tunnel entrance and has interior body lines, upraised arms, and a wavy powerline that extends from the bottom of the body for 23 feet along the panel. The powerline passes beneath 17 figures that appear to be stylized humans or spirit helpers lined up in a row between the shaman and the cave entrance.

Shaman figures are not as common in Montana rock art west of the Continental Divide. However, combination human-thunderbird figures in the northwestern part of the state may represent shamans. Shaman self-portraits have been only minimally documented in eastern Montana, but they do exist. An interesting example at Recognition Rock (24RB165) is an incised human with one foot represented as a bear paw with long claws. These examples demonstrate the variety of shaman portrayals in the state, but none displays the geometric design shapes present at Dillinger Cave. Shield-body shamans here contribute significantly to the distinctiveness of the site and relate it to shamanistic trance more closely than perhaps any other shaman depictions in the state.

ANALYTICAL FRAMEWORK

It is always advantageous to determine possible site function by more than one line of evidence. Traditionally, there has been a heavy reliance on ethnographic analogy to suggest northern Plains rock art site function (Conner and Conner 1971; Keyser 1977, 1979, 1981; Keyser and Knight 1976; Loendorf and Porsche 1985), and this is particularly true for identification of shaman self-portraits (Barry 1991). However, when examining the larger scope of presumed shamanistic rock art, especially when considering nonrepresentational figures, it is essential to test function by additional means.

The Neuropsychological Model presently is one of the most discussed and debated methods of testing rock art for shamanic association. The model receives support because of its cross-cultural nature, based on the assumption that all humans have the same neuropsychological systems, resulting in a biological basis for similar reactions to trance experiences.

The link between rock art and neuralpsychological, standard biological concepts was initially described and discussed by Reichel-Dolmatoff (1971, 1975, 1978, 1987) and later popularized to a wider audience of rock art aficionados by Lewis-Williams and Dowson (1988). While the initial model obviously applies to lowland South America and South Africa, the revised concept has received considerable support and acceptance, with little, if any, direct evidence, across much of the United States.

Reichel-Dolmatoff (1978, 1987) studied the relationships between worldview, mythology, belief systems, and iconography for the Tukano and related groups of southeastern Colombia. His work involved intensive coordination with field informants and resulted in a series of studies of notable

depth and insight. He comments on terminological imprecision in labeling several of these native concepts and prefers the term *design* (rather than *drawing*) to refer to what is produced in the mind and portrayed through real-world media (Reichel-Dolmatoff 1978:149-153).

Reichel-Dolmatoff found that art, or design depiction, is biologically (neurally) based, is observed or experienced by the native, and then is translated and explained in cultural terms. Patterns and figures are seen through drug-induced hallucination, whose use is common throughout South America. Kinds of visions (which influence painted design) are determined by the kind and quality of the drug taken (or mixture of drugs) and the resulting level of hallucinogenic trance that is reached. In the simplest version, these designs are then interpreted in cultural terms, such as following myth, stories, and beliefs. The beliefs are subsequently portrayed according to the neurally based patterns and figures, and a cyclical pattern is thus born and reinforced.

Reichel-Dolmatoff proposed two successive phases or stages of hallucinatory trance, each with its particular characteristics, which are the basis for two stages of design formation. The Phase I of neuropsychological stimulation is neurally based and produces geometric images, simple geometric shapes and patterns, known as phosphenes. The geometric patterns are applied in a traditional manner to objects as either painted or incised designs, and the designs thus formed are an outward projection of neurally based, drug-stimulated abstract light patterns. They are reproducible geometric shapes and patterns derived from—or seen as—phosphenes. These easily observable patterns can be described in natural terms of geometric shapes, many of which have precise or similar counterparts in the real world (like basket designs, shapes of leaves, rays of sunlight). The patterns may then be interpreted as representing cultural ideas. The patterns thereby become graphic symbols, or signs, that express certain major tenets of behavior (Reichel-Dolmatoff 1978:34, 47, 149-153; 1987:12-13).

Reichel-Dolmatoff's Phase II, a deeper trance state, marks the onset of hallucinations of unorganized, shapeless, continuously moving color. The previous geometric elements now turn more to perceived abstract patterns and irregular shapes that move. These abstractions do not exist outside the mind, and only preexisting culturally determined models can interpret the moving colors and shapes as recognizable objects. At the request of the ethnographer, people may attempt to translate these hallucinations or drug-induced projections through culturally conditioned interpretation and portray or illustrate them as culturally meaningful (mythological, educational, culturally controlling) figures, such as people, animals, and specific mythological scenes (Reichel-Dolmatoff 1978:34, 47, 149-153; 1987:12-13).

The first phase recognizes geometric designs that can be drawn, compared to nature, and given cultural meaning. The second phase experiences floating colors that must be processed through culturally conditioned interpretation and then portrayed usually as naturalistic figures, which then can be given cultural meaning. The distinction is recognized both in the field and laboratory and may prove useful in considerations for rock art.

Phase I Tukano designs have been shown to be the same in laboratory induced phosphenes recorded during cross-cultural research and are thus biologically, not culturally, based (Reichel-Dolmatoff 1978:43-47, 1987:Pl.3l). Informants drew and interpreted designs seen in trance, and these are the same designs commonly painted on objects (Reichel-Dolmatoff 1978:29-34) and seen in painted rock art (J. Gréer 1995). Cross cultural designs and some more complex figures, many of which persist through time in lowland South America, are taken to be more biologically based, and not just the product of diffusion or cultural continuity over a long period of time.

Lewis-Williams and Dowson (1988) expand on the Colombian results from their further research in South Africa. They present motifs from mental imagery, derived during trance, which appear to be universally experienced by humans. These designs are essentially the same as those recognized during the Colombian study in which trance designs are the same figures in local rock art. It is believed by developers and subsequent proponents (Whitley 1994) of this somewhat expanded Neuropsychological Model that rock art throughout the world can be tested against this construct. The

model can indicate a shamanistic context for rock art figures and, therefore, help confirm site function, although it cannot determine specific meaning or interpret the images (see Bahn 1997 for a critical review of the application of the model).

Whitley (1994) summarizes Lewis-Williams and Dowson's model and presents examples of its various components in rock art. In testing the model on Dillinger Cave, we use Whitley's comparative figures from the Coso Range in California.

The model's basic tenant is that the person making the rock art is engaged in trance. Shamanic trances are varied and are achieved by different methods, but the overall result is the same—an altered state of consciousness. A commonly used method to enter an altered state (which can range from a meditative condition to full hallucination) to experience trance is the taking of hallucinogenic substances. These materials, all taken in a number of ways, include such things as tobacco, datura, mescal bean, peyote, other kinds of cactus, certain mushrooms, seeds, bark, and leaves, manganese, various fermented drinks, and even fermented urine (Boyd and Dering 1994; Clottes and Lewis-Williams 1996; Whitley 1994). Other methods of inducing or enhancing trance include meditation, intense dancing, drumming, and or simply depriving the body of food, water, warmth, or sleep. Fasting to produce dream states (especially in the cold, wind, and darkness) was perhaps the most popular method among Indians in Montana by the time of ethnographic recording (Denig 1930; Kroeber 1908; Lowie 1963). Furthermore, Kroeber (1908:221) tells of the Gros Ventre and Crow fasting in high places in order to become doctors or receive miraculous powers. These vision quest locations often are still recognizable archeologically, and it appears from these remains that the process has considerable time depth. Thus, the basic belief in the power of trance was probably in-place among Montana tribes long before ethnographers began recording the practice, which provides the basic element necessary for shamanistic rock art function.

MODEL TESTING

The Neuropsychological Model of Lewis-Williams and Dowson (1988:203) has three components. *Component 1* simply defines the different kinds of geometric entoptic patterns, or phosphenes, that people experience. These neural entoptic, or behind-the-eye, patterns can be generated for some people simply by pressing on the closed eyelid. Lewis-Williams and Dowson (1988:203) describe six, nonexclusive biological patterns that recur consistently and are widely experienced during initial stages of trance. These are grids, parallel lines, dots, zigzags, nested curves, and thin meandering lines and are shown in Figure 12, (plus examples of vortices, as added by Whitley 1994). Figure 12 also shows examples as they are expressed in rock art of the Coso Range of California (Whitley 1994:9), plus vortex patterns that recur in that area. In Dillinger Cave a grid pattern of squares represents such a recurring figure. Various kinds of lines also recur, as do variations on the triangle and square. The triangle at Dillinger occurs both alone and as part of a grid pattern. Dots also are common in the inventory, mainly as part of a larger geometric design, such as a dot in the center of a triangle.

Component 2 defines seven general principles that govern how entoptic patterns, as identified individually in *Component 1*, are perceived during trance. The principles are (a) *fragmentation* into component parts, (b) *integration* of two or more images into a complex pattern, (c) *superpositioning*, (d) *juxtapositioning*, (e) *reduplication*, (f) *rotation* of the image off the horizontal, and (g) *replication*. In Dillinger Cave this component appears to be well represented, with integration of basic forms into complex patterns. This occurs most frequently with triangles, dots, lines, squares, and circles combining to form composite geometric designs (Table 2). The two examples of superpositioning discussed above probably also represent this component.

Component 3 deals with progressive stages of mental images experienced by the brain during trance. During these mental stages the patterns of Component 1 and the principles of Component 2 combine in various ways categorized as stages - shown in the three columns of Figure 13. These stages do not necessarily occur in a sequence for all people. Some people move immediately into the third stage while others do not progress beyond the first.

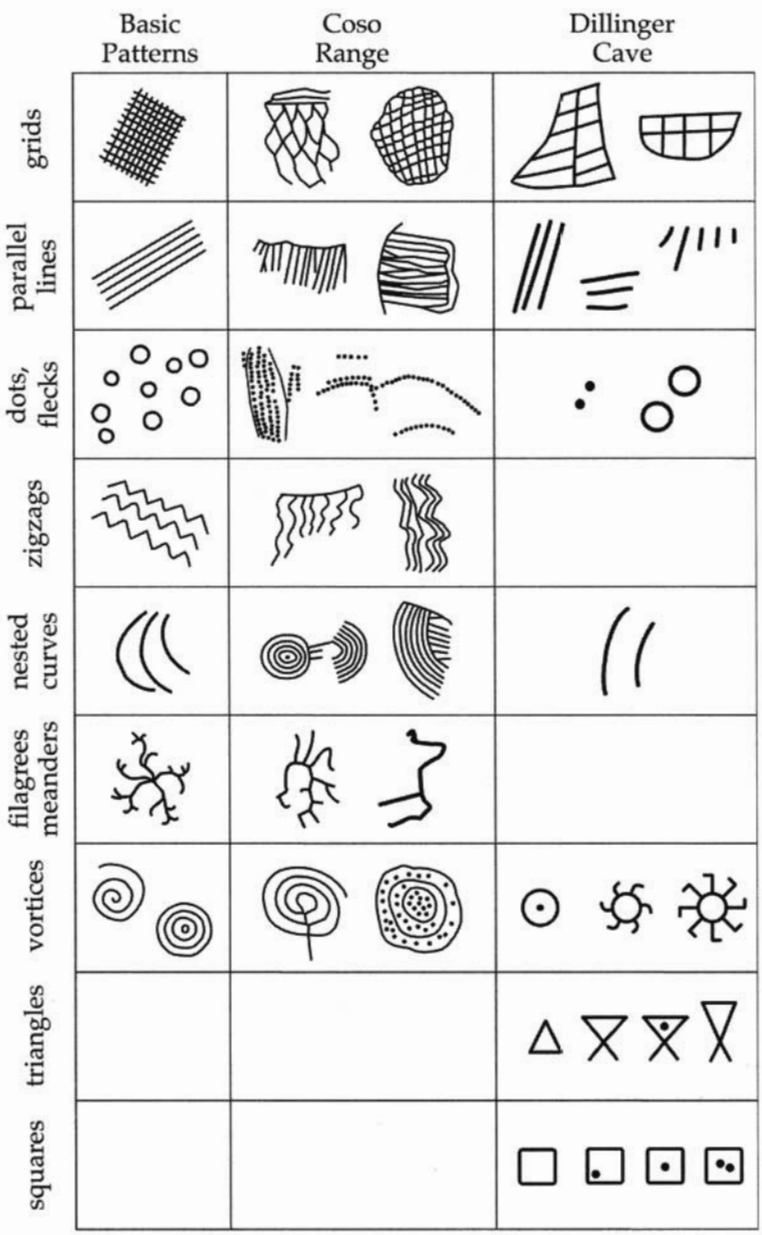

Figure 12. Entoptic or phosphene patterns by phase. Basic patterns (Lewis-Williams and Dowson 1988), entoptic designs in Coso Range rock art (Whitley 1994), and proposed entoptic figures in Dillinger Cave.

In *Stage 1* the person in trance sees entoptic forms only. However, the perception of these forms may vary according the seven principles of Component 2. For example, the entoptic forms may be replicated or juxtaposed. Dillinger Cave contains numerous triangles, which are a simple entoptic form, or phosphenes shape, and many are reduplicated as separate individual figures or placed side by side in a line (Figures 14-15). Other geometric images that could have been made during this stage include the cross (six occurrences), the square (eight occurrences), and fingerlines (16 lines).

In *Stage 2* the person in trance tries to make sense of the phosphene shapes by interpreting them as representational forms, as Reichel-Dolmatoff describes for his Phase I linking of phosphenes with real-world objects. This is something the brain does in a normal state of consciousness when it sees a stream of images, and during trance it similarly attempts to recognize or decode the entoptic forms as objects from the real world. It is during this stage that personal and cultural influences are recognizable in the expression of trance visions (Whitley 1994:9). Figures in rock art that depict this trance stage are often portrayed as animals. Once again, perception of the figures can vary according to the seven principles of Component 2, so it is possible to have them replicated or rotated, for example. In Dillinger Cave it appears that representational forms of this stage are mostly displayed as turtles. Replication is evidenced with the turtle depictions, and several turtles display the rotation principle (Figures 7 and 10). The sway-backed bird (Figure 11) may also have been created during this stage.

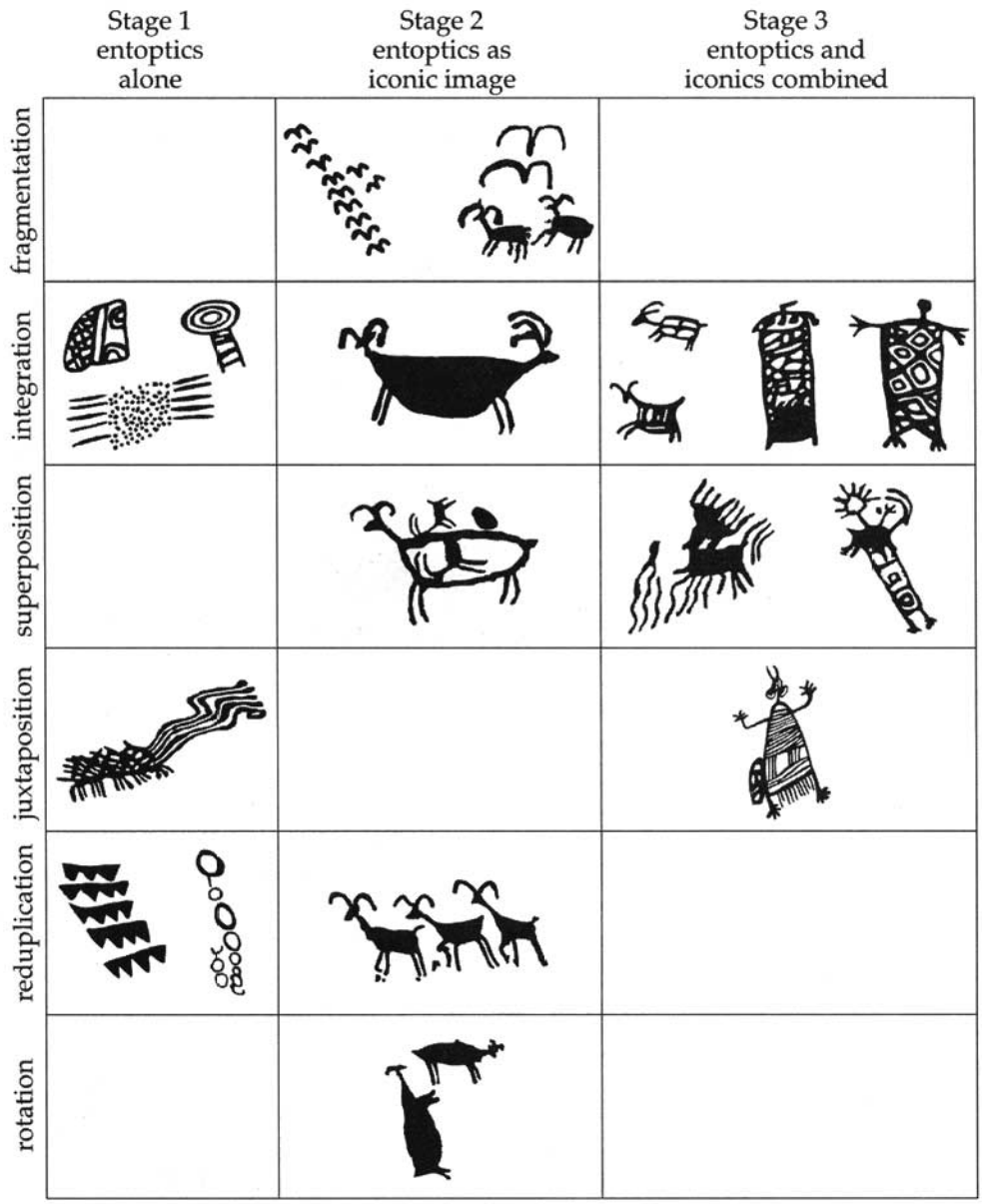

Figure 13. Three stages of Neuropsychological Model Component 3. Rows show six principles (simple replication is omitted) by which basic entoptic patterns vary (after Whitley 1994:11).

In trance *Stage 3* the previous stages of entoptic and representational elements combine. Experiments show that during this stage many people also experience being surrounded by a vortex or rotating tunnel (Lewis-Williams and Dowson 1988:204), apparently exemplary of Reichel-Dolmatoff's Phase II deeper trance state. Representational imagery apparently derives from memory and is commonly associated with previous emotional experiences. However, even in this stage, phosphenes may persist and are interpreted as representational images projected against a background of geometric forms. This is seen in Whitley's Coso Range examples (Figure 12) with grid-body humans and in Dillinger Cave with the same kind of depiction (Figures 9 and 12). The best

Figure 14. Example of Stage 1 simple entoptic forms from Dillinger Cave showing replicated and juxtaposed single triangles.

examples in Dillinger are the shield-body shamans filled with a grid pattern of squares, triangles, and dots—the basic phosphene patterns in the cave (Figures 5-8). These shamans also have headdresses of multiple triangles. The main shield-body shaman is surrounded by a circle of rotating turtles and geometric images (Figure 7) suggestive of a vortex portrayal. The turtles and geometrics provide a feeling of movement around the shaman, who is in the center of the vortex.

CONCLUSIONS

Comparing the rock art in Dillinger Cave with the basic tenets of the Neuropsychological Model shows that these painted figures conform to designs expected during different stages of trace, thus supporting the suggesting that rock art here functioned within a shamanistic context. All components of model are recognizable in Dillinger Cave, and all three stages of trance appear to be present. The numerous triangles best exemplify figures drawn during the first stage, while turtles in their rotating positions adhere to the second and third stages.

Dillinger Cave indicates a close association between the shield-body humans and the turtle motif. Almost all of the 31 turtles thus far recorded in Montana rock art occur in central Montana (Greer and Greer 1999), suggesting a special place for this animal among the cultures of the region. Turtles were important in creation stories of several northern Plains and adjacent Rocky Mountain tribes (e.g., Clark 1973), and turtles are reported to have protected Algonquian shamans during their work (Vastokas and Vastokas 1973:52). Therefore, the turtle is a logical choice for a third-stage drawing for which transformation is into an animal form familiar to the culture (Clottes and Lewis-Williams 1998:17). Additionally, these turtles are positioned around the shield-like shaman as if portraying the vortex which people are drawn into to reach *Stage 3*.

Although we have only considered a few criteria of rock art produced during trance, this limited exercise demonstrates that most, if not all, figures in this cave are congruent with an altered state

Figure 15. Drawing of the Stage 1 Dillinger Cave figures shown in Figure 14.

of consciousness. Under this model, the co-occurrence of geometric and representational figures of the same age in shamanistic sites is explained due to a common origin during trance rather than the result of cultural style differences (Whitley 1994:12), and such an explanation may be appropriate to the Dillinger Cave figures. The model does not tell us how or why a shaman entered trance or the cultural meaning of the figures, but it does suggest that figures in Dillinger are the kinds predicted to be drawn during a hallucinogenic trance. It provides one more line of evidence suggesting the cave was used for shamanistic purposes, and it supports use of the Neuropsychological Model for evaluating possible site function or association.

ACKNOWLEDGMENTS

We thank our uncle, Charles Gestring, for initially directing us to Dillinger Cave, and the Tynes family for allowing access. We also thank Doug Habermann and Joe O'Neill (Montana Fish, Wildlife and Parks), Sandra Morris French (Lewis and Clark National Forest archeologist), and Richard Newton (previous Lewis and Clark National Forest archeologist) for their support of our Smith River research. Also thanks to Dr. James Keyser and Dr. David Whitley whose previous shamanism publications, presented papers, and personal discussions have provided a stimulus for our work on this subject. Keyser provided drawings for Figures 7 and 8, as well as numerous helpful review comments. Special thanks are also due to Dr. Julie Francis for her in-depth review comments.

REFERENCES CITED

Bahn, Paul
1997 Membrane and Numb Brain: A Close Look at a Recent Claim for Shamanism in Palaeolithic Art. *Rock Art Research* 14(1):62-68.

Barry, P. S.
1991 *Mystical Themes in Milk River Rock Art*. University of Alberta Press, Edmonton.

Boyd, Carolyn E. and J. Phil Dering
1994 Medicinal and Hallucinogenic Plants Identified in the Sediments and Pictographs of the Lower Pecos, Texas Archaic. Paper presented at the 59th Annual Meeting of the Society for American Archaeology, Anaheim.

Catlin, George
1860 *Letters and Notes on the Manners, Customs, and Condition of the North American Indians*. J. W. Bradley, Philadelphia.

Clark, Ella E.
1973 *Indian Legends from the Northern Rockies*. University of Oklahoma Press, Norman.

Clottes, Jean and David Lewis-Williams
1998 *The Shamans of Prehistory. Trance and Magic in the Painted Caves*. Harry N. Abrams, Inc., New York.

Cole, Sally J.
1989 Iconography and Symbolism in Basketmaker Rock Art. In *Rock Art of the Western Canyons*, edited by Jane S. Day, Paul D. Friedman and Marcia J. Tate, pp. 59-86. Colorado Archaeological Society Memoir 3. Joint publication of the Denver Museum of Natural History and the Colorado Archaeological Society, Denver.

Conner, Stuart W. and Betty L. Conner
1971 *Rock Art of the Montana High Plains*. The Art Galleries, University of California, Santa Barbara.

Denig, Edwin Thompson
1930 Indian Tribes of the Upper Missouri. *Annual Report of the Bureau of American Ethnology to the Secretary of the Smithsonian Institution*. 46. Smithsonian Institution, Washington, D.C.

Eliade, Mircea
1964 *Shamanism: Archaic Techniques of Ecstasy*. Bollingen Foundation, New York.

Edwards, Dean
1995 *Shamanism—General Overview—Frequently Asked Questions (FAQ)*. Retrieved February 16, 2003 from http://www.deoxy.org/shaover.htm.

Ewers, John C.
1955 *The Horse In Blackfoot Indian Culture*. Bureau of American Ethnology Bulletin 159. Smithsonian Institution, Washington, D.C.
1982 The Awesome Bear in Plains Indian Art. *American Indian Art* 7(3):36-45.

Francis, Julie E. and Lawrence L. Loendorf
2002 *Ancient Visions. Petroglyphs and Pictographs of the Wind River and Bighorn Country, Wyoming and Montana*. The University of Utah Press, Salt Lake City.

Greer, John W.
1995 Rock Art Chronology in the Orinoco Basin of Southwestern Venezuela. Unpublished Ph.D. dissertation, Department of Anthropology, University of Missouri, Columbia.

Greer, Mavis L.
1995 Archaeological Analysis of Rock Art Sites in the Smith River Drainage of Central Montana. Unpublished Ph.D. dissertation, Department of Anthropology, University of Missouri, Columbia.

Greer, Mavis and John Greer
1993 Shamans in the Pictographs of the Smith River Drainage in Central Montana. Paper presented at the 58th Annual Meeting of the Society for American Archaeology, St. Louis.
1994 Shaman Activity Portrayed in the Pictographs of Central Montana. Paper presented at the International Rock Art Congress hosted by the American Rock Art Research Association, Flagstaff.
1996 Central Montana Rock Art. *Archaeology in Montana* 37(2):43-56.
1999 Turtles in Montana Rock Art. Paper presented at the San Diego Museum of Man Rock Art Symposium, San Diego.

Hedges, Ken
1976 Southern California Rock Art as Shamanic Art. In *American Indian Rock Art*, vol. 2, edited by Kay Sutherland, pp. 126-138. El Paso Archaeological Society, Inc., El Paso.
1983 The Shamanic Origins of Rock Art. In *Ancient Images on Stone: Rock Art of the California*, edited by Jo Anne Van Tilburg, pp. 46-59. The Rock Art Archive, The

Institute of Archaeology, Los Angeles.

1985 Rock Art Portrayals of Shamanic Transformation and Magical Flight. In *Rock Art Papers*, vol. 2, edited by Ken Hedges, pp. 83-94. San Diego Museum Papers No. 18. San Diego Museum, San Diego.

Irwin, Lee

1994 *The Dream Seekers. Native American Visionary Traditions of the Great Plains*. University of Oklahoma Press, Norman.

Jones, Bernard M., Jr.

1990 Shamanistic Elements in Sierra de San Francisco Rock Art. In *Rock Art Papers*, vol. 7, edited by Ken Hedges, pp. 11-18. San Diego Museum Papers No. 26. San Diego Museum, San Diego.

Keyser, James D.

1977 Audrey's Overhang: A Pictographic Maze in Central Montana. *Plains Anthropologist* 22:183-187.

1979 The Central Montana Abstract Rock Art Style. In *CRARA '77, Papers From the Fourth Biennial Conference of the Canadian Rock Art Research Associates*, pp. 153-177. Heritage Record No. 8. British Columbia Provincial Museum, Victoria.

1981 Pictographs at the DesRosier Rockshelter. *Plains Anthropologist* 26(94) part 1:271-276.

1990 Rock Art of North American Northwestern Plains: An Overview. *Bollettino del Centro Camuno di Studi Preistorici* 25-26:99-122.

Keyser, James D. and Michael A. Klassen

2001 *Plains Indian Rock Art*. University of Washington Press, Seattle.

Keyser, James D. and George C. Knight

1976 The Rock Art of Western Montana. *Plains Anthropologist* 21:1-12.

Kroeber, A. L.

1908 *Ethnology of the Gros Ventre*. Anthropological Papers Vol. 1, Pt. 4. American Museum of Natural History, New York.

Lewis-Williams, J. David

1983 *The Rock Art of Southern Africa*. Cambridge University Press, Cambridge.

Lewis-Williams, J. David and Thomas A. Dowson

1988 The Signs of All Times: Entoptic Phenomena in Upper Palaeolithic Art. *Current Anthropology* 29(2):201-245.

Loendorf, Lawrence L.

1994 Finnegan Cave: A Rock Art Vision Quest Site in Montana. In *Shamanism and Rock Art in North America*, edited by Solveig A. Turpin, pp. 125-137. Special Publication 1. Rock Art Foundation, Inc., San Antonio.

Loendorf, Lawrence and Audrey Porsche

1985 *The Rock Art Sites in Carbon County Montana*. Contribution #224. Department of Anthropology, University of North Dakota, Grand Forks.

Lowie, Robert H.

1963 *Indians of the Plains*. Reprinted. The Natural History Press, Garden City. Originally published 1954, McGraw-Hill Book Company, Inc., New York.

Park, Willard Z.

1938 *Shamanism in Western North America*. Northwestern University, Evanston, Illinois.

Reichel-Dolmatoff, Gerardo

1971 *Amazonian Cosmos, The Sexual and Religious Symbolism of the Tukano Indians*. The University of Chicago Press, Chicago.

1975 *The Shaman and the Jaguar, A Study of Narcotic Drugs Among the Indians of Columbia*. Temple University Press, Philadelphia.

1978 *Beyond the Milky Way, Hallucinatory Imagery of the Tukano Indians*. UCLA Latin American Center Publications, University of California, Los Angeles.

1987 *Shamanism and Art of the Eastern Tukanoan Indians, Colombian Northwest Amazon*. E. J. Brill, Leiden, The Netherlands.

Shafer, Harry J.

1986 *Ancient Texans: Rock Art and Lifeways along the Lower Pecos*. Texas Monthly Press, Austin.

Sundstrom, Linea

1989 Rock Art of the Southern Black Hills: A Contextual Approach. Unpublished Ph.D. dissertation, Department of Anthropology, University of Kansas, Lawrence.

Teit, James

1930 Salishan Tribes of the Plateau. *Annual Report of the Bureau of American Ethnology* 45: 23-396. Smithsonian Institution, Washington, D.C.

Turpin, Solveig A.

1994 On a Wing and a Prayer: Flight Metaphors in Pecos River Art. In *Shamanism and Rock Art in North America*, edited by Solveig A. Turpin, pp. 73-102. Special Publication 1. Rock Art Foundation, Inc., San Antonio.

Vastokas, Joan M. and Romas K. Vastokas

1973 *Sacred Art of the Algonkians: A Study of the Peterborough Petroglyphs*. Mansard Press, Peterborough, Ontario.

Wellmann, Klaus F.

1979 *A Survey of North American Indian Rock Art*. Akademische Druck- u. Verlagsanstalt, Graz, Austria.

Wissler, Clark

1912 *Ceremonial Bundles of the Blackfoot Indians*. Anthropological Papers Vol. 7, Pt. 2. American Museum of Natural History, New York.

Whitley, David S.

1992 Shamanism and Rock Art in Far Western North America. *Cambridge Archaeological Journal* 2:89-113.

1994 Shamanism, Natural Modeling and the Rock Art of Far Western North American Hunter-Gatherers. In *Shamanism and Rock Art in North America*, edited by Solveig A. Turpin, pp. 1-43. Special Publication 1. Rock Art Foundation, Inc., San Antonio.

2000 *The Art of the Shaman. Rock Art of California*. The University of Utah Press, Salt Lake City.

Whitley, David S. (editor)

2001 *Handbook of Rock Art Research*. AltaMira Press, Walnut Creek.