LETTERS

An Anasazi Solar Marker?

On 15 June 1978, Anna Sofaer sent me a copy of a paper that had been read a month earlier at a conference on rock art (*1*); she enclosed a note asking for my thoughts or comments. In my reply of 27 June (*2*), I raised a number of questions and made several suggestions regarding the study. The article, "A unique solar marking construct" by Sofaer, Zinser, and Sinclair (19 Oct. 1979, p. 283), resolves some of the points I raised; however, several are not dealt with satisfactorily, and the article raises additional and unresolved issues. The recent publication by Frazier (*3*) on the same site does little to clarify the situation.

My comments here pertain mainly to the authors' discussion of the cultural background of the "solar marking construct," but I also have one point to make about the site itself. These comments bear on the validity of the authors' interpretation of the site as Anasazi, not on its operation as a solar marker. It seems to work just as they describe.

The authors state, "Several factors show that the Anasazi inhabitants of Chaco developed the construct between A.D. 900 and 1300 . . . and indicate that the specific time was between A.D. 950 and 1150. . . ." These factors, as nearly as I can determine from their discussion which follows this statement, include the following: (i) the historic Pueblos perform sun-watching rituals from atop or near the tops of mountains and buttes; (ii) shadow and light are used to mark important solar dates such as the solstices and equinoxes; (iii) spiral designs are found in association with petroglyphs thought to represent the sun; and (iv) astronomical alignments have been discovered at Anasazi sites at Chaco Canyon. The specific argument which the authors advance for the A.D. 950 to 1150 date for the Fajada Butte site is that the Chaco people at this time had the necessary planning skills and solar interests. Let us examine the evidence point by point.

1) While it is true that *some* historic Pueblos use outlying locales for sun-watching, the physical structures of their shrines at these sites differ markedly from the Fajada Butte site. At Zuñi, the *p̂ekwin* (Sun Priest) sights from a tower on the north side of the pueblo to a pillar in the gardens to the east and then to a point on the eastern horizon (*4*). At Acoma, the shrine consists of a rock cairn from which the observations are made to the distant horizon. A fire is then lit to signal priests back in the village that the solstice has arrived (*5*). My work at Chaco (*6*) indicates that such cairn-hearth sighting complexes are the type commonly found. At Cochití, a small window in the *Flint-Ku-sha'lī* house is used by the *cacique* (head priest) to make solar observations (*7*). At Walpi (First Mesa Hopi), the *ta'wa moñwĭ* (Sun Watcher or Sun Priest) sights along a wall of a particular building to various points on the horizon, while at the other Hopi pueblos, the distant horizons are used almost exclusively for sun-watching (*8*). The *only* example I have found for the historic Pueblos that even remotely resembles the Fajada Butte situation is at Jemez; here a pillar, erected *in* the pueblo on the site of the old Spanish Catholic church (making it relatively recent), is used to cast shadows for solar timekeeping (*9*). Thus, the physical structure of the Fajada Butte site does not fit the ethnographic data as we understand them.

2) The authors are correct that shadow and light are used by the Pueblos to record solar movements. Examples of this can be found at Cochití (*7*), Jemez (*9*), and Taos (*9*). At the distant shrines, however, the observational practices involve watching the sun in conjunction with horizon markers and not the use of shadow or light casting (*6, 8–10*).

3) Spiral designs are sometimes found in association with sun petroglyphs. But no sun petroglyph is found at the Fajada Butte site, and spirals do not appear to be found at the ethnographic Pueblo shrines noted above. Cushing (*4*), for example, records a number of designs at the Zuñi stone chair, but no spiral. The spiral both predates and postdates the Anasazi occupation. More important is the considerable body of ethnographic literature on Pueblo symbols which indicates that the spiral is usually interpreted as a water design or a serpent motif (*11*), not a sun representation. While serpents are often identified as sky gods associated with the sun (*12*), Sofaer *et al.* do not advance this hypothesis to explain the spiral. Sun and water are necessary elements for farming, but they are *distinct* elements in Pueblo symbolic systems. Serpents are associated with both sun and water (*6, 8, 11, 12*) but are similarly distinct. As I have noted (*6, 13*), one needs to have a thorough understanding of the ethnographic data *before* undertaking archaeoastronomical studies in the Southwest. The Pueblo area is noted for the remarkable cultural continuity between the prehistoric and historic villages, which affords excellent opportunities for the use of direct historical analysis, ethnoarchaeology, and ethnographic analogy in the study and interpretation of archaeological remains. A thorough search of the ethnographic and ethnohistoric literature on the Pueblos shows that the Fajada Butte site does not fit the known ethnographic context.

4) Astronomical alignments have been found incorporated within a variety of cultural and architectural features at Chacoan Anasazi sites, and natural rock formations also appear to have been used for solar observations (*6, 10, 14*). But that the Chacoan Anasazi built sites with astronomical alignments incorporated into some of their features does not mean that they built the Fajada Butte site. Pueblo materials are found on and around Fajada Butte, but so are the remains of other native cultures. Aside from the slabs, the surfaces of which *may* have been modified (authors note 14), and the two petroglyphs, none of which can be dated directly and accurately, there is no evidence that the site is Chacoan Anasazi rather than Basket Maker (earlier) or Navajo (later). The chronological data needed to resolve this particular issue are not available.

The argument for dating the Fajada Butte site at A.D. 950 to 1150 on the basis of the obvious planning skills and solar interests of the Chacoan inhabitants is similarly unacceptable. Indeed, the statement, itself is a non sequitur. Because the Anasazi built astronomically aligned features at this time does not mean that they built the Fajada Butte site. The conclusion does not follow from the premise, especially in the absence of artifactual data to support it. Nor can one assign with confidence the A.D. 950 to 1150 date to the site in the absence of associated materials (pottery, masonry, charcoal, and so forth) that can be used for either direct or cross-dating of the slabs and petroglyphs. Astronomical alignments have been suggested for Chacoan structures which predate A.D. 950, for example, the Great Sanctuary at Shabik'eschee Village (*15*). Thus, the evidence the authors cite to support the A.D. 950 to 1150 date, like the evidence for the fourth point above, is, at best, indirect and of questionable applicability. The fact remains that no data have yet been discovered which clearly tie the Anasazi to the Fajada Butte solar marker. They *may* have built it, but to state so unequivocally is, at the very least, premature given our present information.

Three final points:

1) The "buttress" of smaller rocks appears to be natural, not cultural as the authors claim. In their figure 3, similar groups of stones can be seen to the right of the slabs at the base of the cliff, direct-

ly behind the theodolite, and also to the left of it. My own examination of the site reaffirms my opinion. Of course, this does not make the buttressing effect of the stones any less real, only less deliberate.

2) Given the engineering and architectural skills of the Chacoan Anasazi (*10, 16*), the Fajada Butte site seems strangely crude and less developed (although not necessarily less precise) than one might expect. The Chacoans built magnificent walls of banded, close-fitted masonry, even when they covered them immediately after construction with adobe plaster (*16*). The lack of or minimal shaping apparent on the slabs seems out of character with Chacoan construction and resembles more that found at some of the sites at Mesa Verde (*17*). There is, of course, no evidence that the Mesa Verde peoples built the Fajada Butte site, at least none that has come to light.

3) The authors state, "Pueblo Bonito . . . was built with its primary elements of design precisely aligned to the rising and setting of the equinox sun and the daily noon position of the sun." They do not indicate what these "primary elements" are, but the present form of the site represents, more or less, the last in a long series of construction phases and is quite different from the earlier configurations. Judd (*16*) has shown that the front and center walls of Pueblo Bonito (which, I suspect, may be the "primary elements" to which Sofaer *et al.* refer) were added late in the construction. With the addition of these walls, Pueblo Bonito may have had major architectural features aligned to the equinox (*6*), as well as to the winter solstice sunrise (*10*). But these features are secondary, not primary in terms of the construction sequence. From its inception, however, Pueblo Bonito was apparently planned and oriented to maximize *insolation*, thereby making it a highly efficient structure (*18*).

The solar marking site discovered by Sofaer *et al.* is unique, as far as we know. It is an important discovery, and the site may very well be prehistoric. Nevertheless, it is questionable whether the Anasazi built it, at least on the basis of the evidence presented by the authors. We cannot date either the slabs or the petroglyphs; there are no artifacts found in direct association with the site that are definitely Chacoan Anasazi; and the site does not fit well with the ethnographic data on Pueblo astronomy. The authors suggest that further study may help to clarify the situation. I hope they undertake this additional work, but with an archaeologist and Pueblo ethnographer on their research team. Failure to do this greatly reduces the likelihood that truly valid results will be achieved and that the site will be placed in its proper historic context.

JONATHAN E. REYMAN
Department of Sociology, Anthropology and Social Work, Illinois State University, Normal 61761

References and Notes

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2. J. E. Reyman, private communication.
3. K. Frazier, *Science 80* **1**, 56 (1979).
4. C. H. Lange and C. L. Riley, *The Southwestern Journals of Adolph F. Bandelier: 1883–1884* (Univ. of New Mexico Press, Albuquerque, 1970), pp. 69–70; M. C. Stevenson, *Bur. Am. Ethnol. Annu. Rep. 23* (1904); F. H. Cushing, *My Adventures at Zuñi* (Peripatetic Press, Santa Fe, N.M., 1941). Cushing also notes that the Sun Priest sits in a crude stone chair to make observations.
5. L. A. White, *Bur. Am. Ethnol. Annu. Rep.* **47**, 17 (1932); J. E. Reyman, unpublished fieldnotes, 1968 and 1971.
6. J. E. Reyman, *Mexican Influence on Southwestern Ceremonialism* (University Microfilms, Ann Arbor, Mich., 1971).
7. C. H. Lange, *Cochití: A New Mexico Pueblo Past and Present* (Univ. of Texas Press, Austin, 1959).
8. A. M. Stephen, *Hopi Journal*, E. C. Parsons, Ed. (Columbia Univ. Press, New York, 1936); M. Titiev, *Mus. Northern Ariz. Mus. Notes* **11**, 39 (1938).
9. F. H. Ellis and L. Hammack, *Am. Antiq.* **33**, 25 (1968).
10. J. E. Reyman, *Science* **193**, 957 (1976).
11. J. W. Fewkes, *Am. Anthropol.* **6**, 535 (1904); E. C. Parsons, *Pueblo Indian Religion* (Univ. of Chicago Press, Chicago, 1939); see also R. Bunzel, *The Pueblo Potter* (Columbia Univ. Press, New York, 1929); J. W. Fewkes, *Bur. Am. Ethnol. Annu. Rep. 17* (1898); *Bur. Am. Ethnol. Bull. 33* (1919).
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13. J. E. Reyman, in *Archaeoastronomy in Pre-Columbian America*, A. F. Aveni, Ed. (Univ. of Texas Press, Austin, 1975), pp. 205–215.
14. R. A. Williamson, H. J. Fisher, D. O'Flynn, in *Native American Astronomy*, A. F. Aveni, Ed. (Univ. of Texas Press, Austin, 1977), pp. 203–217.
15. F. H. H. Roberts, Jr., *Bur. Am. Ethnol. Bull. 92* (1929). I prefer the term Great Sanctuary, the original designation for these structures, to the more commonly used (and later term) Great Kiva. These structures were more than oversized kivas. For a discussion of this, see (*6*).
16. G. H. Pepper, *Anthropol. Pap. Am. Mus. Nat. Hist. 27* (1920); N. M. Judd, *Smithson. Misc. Collect.* **147**, 1 (1964); F. Hawley, *Univ. N.M. Bull. Monogr. Ser.* **1**, 1 (1934).
17. A. H. Rohn, *Cultural Change and Continuity on Chapin Mesa* (Regents Press of Kansas, Lawrence, 1977).
18. R. E. Knowles, *Energy and Form* (MIT Press, Cambridge, Mass., 1974); J. E. Reyman, in *Desert Planning: International Lessons*, G. Golany, Ed. (Architectural Press, London, in press).
19. Supported by NSF grants GS-40410 and BNS77-08070 and by grants from Illinois State University. The comments of F. Lange are gratefully acknowledged.

We are grateful for the opportunity to reply to Reyman's letter. We note that Reyman's comments affirm our article's description of the operation of the Fajada solar marking construct. We repeat the point made in the very title of our article and underscored in our conclusion: the *uniqueness* of the Fajada construct among known archaeoastronomy sites. We find no clear precursors in it in any of the cultures of the Southwest. It does not fit clearly into what was hitherto known about *any* of these cultures. Yet it belongs to one of them, and thus it adds to and expands the "ethnographic context." (Reyman's reference to the "Jemez site" is not clear: what he describes seems to be a form of sundial, yet his reference 9 describes a totally different sunrise alignment. Neither description bears any relation to the Fajada assembly.) The nearest to it is the calendar-marking "channeling of light" by architectural features of various Anasazi buildings, to which we referred.

We stated explicitly that our assignment to a particular portion of the Anasazi period was of necessity without archaeological confirmation of the site and was probabilistic in nature. The construct required an accurate solar-based calendar, a tradition of observing the sun's motion, and a strong interest in the matter; the "leap forward" that it represents would have occurred *most likely* in the most favorable milieu. The assignment to the Anasazi at the time of their cultural florescence is, we feel, the most consistent with present knowledge; attempts to assign it otherwise on narrow grounds yield incongruities. Future findings could, of course, always change this analysis.

We attempted no explanation of why a spiral was chosen as the focus of the construct. Since this carefully inscribed spiral is used in a clear solar-calendric context, we seem to have found a new example of the use of this symbol, to add to the existing examples rather than to contradict them.

We trust that our findings will inspire further work at Chaco, both a detailed archaeological study of the Fajada site and a more general study of this aspect of Native American thought including a search for analogous sites and precursors. We certainly hope to participate in the future work at this exciting juncture. Archaeoastronomy, archaeology, and ethnography are indeed interwoven, as Reyman points out, but new discoveries in one subfield can open new and unexpected vistas for the others.

ANNA SOFAER
VOLKER ZINSER
ROLF SINCLAIR
Anasazi Project, Inc., 2025 I Street, NW, Suite 524, Washington, D.C. 20006

Erratum: In the News and Comment article by R. Jeffrey Smith, "Reprocessing plans may pose weapons threat" (11 July, p. 250), it was reported that future reprocessing plants would process 150 tons of plutonium annually. The correct amount is 15 tons.