OBSERVATIONAL ARCHAEOASTROMONY AT THE MAJORVILLE MEDICINE WHEEL COMPLEX: WINTER AND SUMMER SOLSTICE SUN RISE AND SET ALIGNMENTS ACCURATE TO 0.2°

Gordon R. Freeman and Phyllis J. Freeman

Abstract

The Majorville Medicine Wheel is actually a Sun Cairn surrounded by a Rayed Ring. It is the central construction of an enormous Sun Temple that extends over about 100 square kilometres. There are auxilliary cairns on the site that make up, among other things, an accurate calendar. On occasion I have been asked why people who followed the bison would have wanted an accurate calendar. The answer is that the Sky is a map that is fascinating, and some people are drawn to read it. I have found no evidence that people who lived here five or ten thousand years ago were less intelligent than us. Examine an Eden or Scottsbluff point. It is possible that while Europeans and Asians were advancing in technology, Americans were advancing in philosophy. When mortal conflict arises between technologists and philosophers, the technologists win. We display some of the Solstitial Sun Rise and Set lines at the Sun Temple near Majorville that have put the subject of Archaeoastronomy on a sounder, empirical foundation. An appropriate time window to be considered for the evolution of The Sun Temple near Majorville is 6000 to 200 years ago. We continue to urge Archaeological Survey of Alberta officials to designate more of the Majorville site.

Résumé

Le cromlech (Medicine Wheel) de Majorville est en fait un cairn solaire édifié au centre d'un cercle à rayons concentriques. Il s'agit de la construction centrale d'un immense temple solaire qui occupe plus de 100 kilomètres carrés. Il y a sur les lieux des cairns auxiliaires qui constituent, entre autres choses, un calendrier d'une grande précision. On m'a parfois demandé pourquoi des populations nomades qui vivaient sur les traces des bisons avaient ressenti le besoin d'un calendrier exact. Tout ce que je peux répondre est que le ciel est une carte fascinante que certaines personnes ne peuvent s'empêcher de vouloir déchiffrer. Rien n'est jamais venu me prouver que les hommes qui vivaient ici il y a cinq ou dix mille ans étaient moins intelligents que nous. Il suffit pour s'en convaincre de songer aux pointes de jet lancéolées Eden ou Scottsbluff. Peut-être que pendant que les Européens et les Asiatiques faisaient des progrès en technologie, les Américains en faisaient en philosophie... Quand un conflit mortel éclate entre les technologues et les philosophes, ce sont les premiers qui l'emportent. Nous allons montrer certains des alignements orientés sur les levers et couchers solsticiaux qui, au temple solaire proche du site de Majorville, assoient désormais l'archéoastronomie sur des bases empiriques plus solides. Les techniques mises au point près de Majorville ont été appliquées à Stonehenge et donnent infiniment plus de poids aux données archéoastronomiques sur ce temple solaire. Nous demandons une fois de plus à la Commission archéologique de l'Alberta de classer une plus grande partie du site de Majorville.

Introduction

"Medicine Wheel" is a name given to several kinds of approximately circular or radiating patterns of stones placed on the ground by prehistoric societies. Different types of medicine wheels served different purposes (Kehoe and Kehoe 1977; Brumley 1988). A few of them contain stone or cairn alignments

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directed toward Rise or Set points of the Sun or of a bright star at a particular time of the year. These constructions relate to archaeoastronomy (Eddy 1974, 1979; Eddy and Hopper 1977; Kehoe and Kehoe 1977, 1979).

The suggestion that some medicine wheels are associated with archaeoastronomy has been criticized on the basis of comparisons of measured stone line directions with directions calculated by assuming that the earth is perfectly spheroid (Haack 1987a,b). While Haack is correct in stating that a 35 m line between two cairns is not long enough to accurately mark a Solstitial Sun Rise or Set (Eddy 1974, 1979; Kehoe and Kehoe 1977, 1979, 1987), the actual directions of the stone lines are governed by local topography, so the statistical analysis of the directions was of little use in this respect. Furthermore, Haack's analysis assumed errors of ±2 Sun diameters, whereas some of the long lines that we have observed are accurate to ±0.2 diameters, so his conclusions underestimated the quality of ancient science.

Sun Rise and Set points move along the horizon very slowly near a Solstice. At the Majorville Medicine Wheel (MMW) it takes *nine* days to move the last Sun diameter (0.53ϒ) to the Solstice position. It takes three days to move the last 0.1 diameter (0.05ϒ), and another three days to move back by 0.1 diameter. Such slow motion requires a long sighting line to be detected accurately. We have found several such lines that are up to 2 km long.

MMW Complex Site Location

The MMW is on top of the Northeast-most of three high hills in the vicinity, at 50ϒ 35'06" (50.586ϒ) N latitude and 112ϒ 24'38" (112.410ϒ) W longitude, 918 m above mean sea level, and 163 m above the Bow River. The river is 2.4 km East of the Wheel and flows Southwesterly at that location, reaching the closest approach 1.8 km SE of the Wheel. Steep banks of the river valley are 700 m E and SE of the Medicine Wheel (Fig. 1).

There are many cairns and rings of stones within 3 km of the Medicine Wheel, making an MMW Complex Site that covers at least 30 km^2. Several cairn alignments accurately mark the Cardinal Directions, which can be determined without use of a clock or magnetic compass, by measuring motions of the Stars and Sun. There are also three camps, which contain more than 400 tipi rings, on the North side of the Bow River, at distances 4, 8 and 10 km North and Northwest of the MMW. There is another cluster of tipi rings and many other artifacts 5 km Southeast of the MMW. There are several bison wallows and traps, and at least one bison jump within this zone. We conclude that the total area that contains artifacts culturally associated with the MMW Complex is about 100 square kilometres.

Gullies and notches in the high, steep banks of the Bow River provide tally marks for the Rise points of the Sun, Moon and Stars. Some of the gullies provide easy access to the river from the high plain on either side.

Figure 2 displays the central portion of the site, viewed from 8 km West by North, at different zooms. The Majorville Medicine Wheel is actually a Sun Cairn surrounded by a rayed ring, and is here labelled Sun Cairn Ring SCR, on the Main Hill. The hills labelled "Secondary Hill" and cairns "44 and 45" are the same height as the Main Hill, 918 m above mean sea level, but the Main Hill is at the Northeast end of the string.

The labels in Figure 2 are explained in the legend. The flat-topped hill FT has been cleared of rocks, except for a small cairn on the East end. The Winter Solstice Sun Set line described below has its back

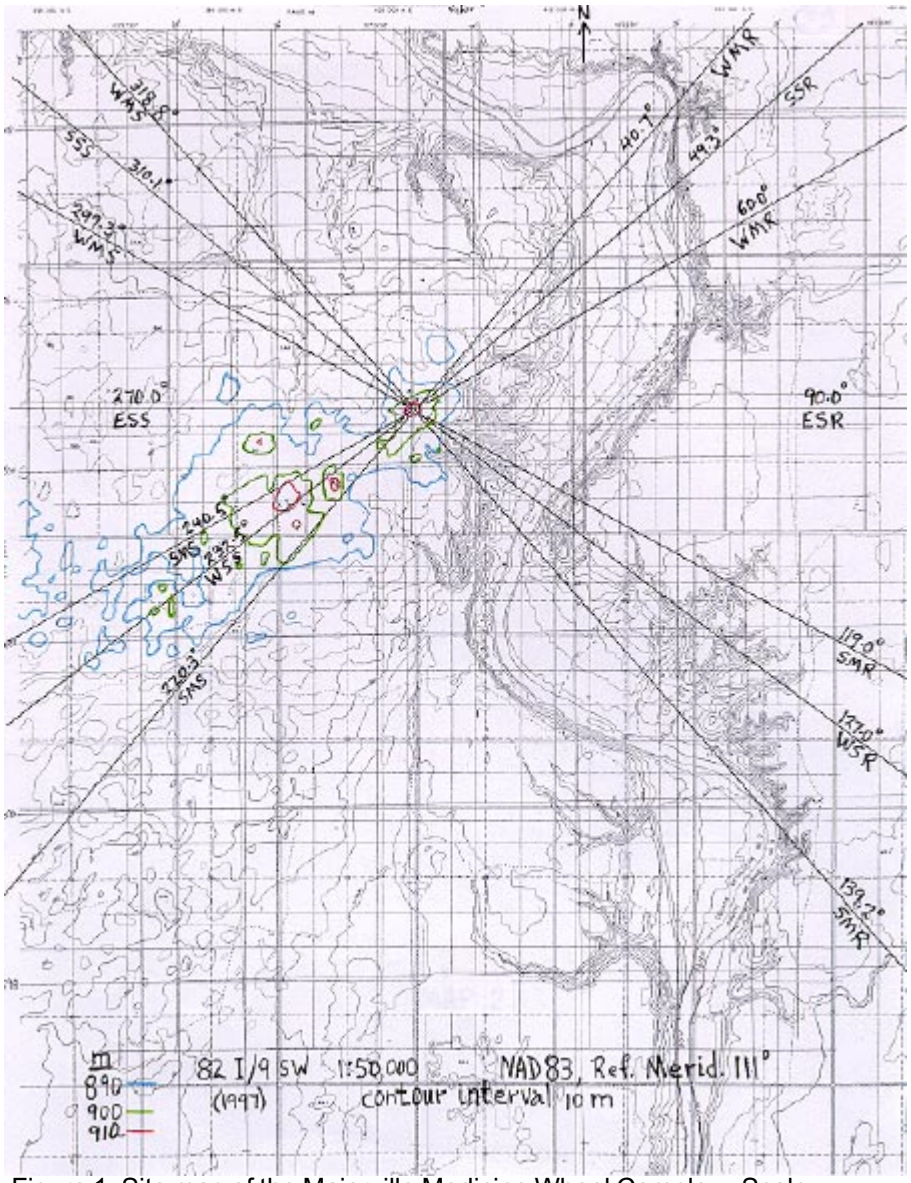

Figure 1. Site map of the Majorville Medicine Wheel Complex. Scale 1:50,000. The Medicine Wheel is at the centre of the radiating lines; it is a Sun Cairn Ring (SCR in Fig. 2). The map is taken from a large, Archival Report that is being written; it contains more information than needed in this paper. WMR = Winter Moon Rise direction; SSR = Summer Solstice Sun Rise direction; SSS = Summer Solstice Sun Set direction; and so on. For the geographic coordinates, see text. Many site reports are listed under *Publications* in http://www.ualberta.ca/~gfreeman.

sight in the North House NH, and its foresight is cairn 45. The Summer Solstice Sun Rise line has its back site in the rock configuration 41, and its foresight in NH.

NH is 65 m North of the Sun Cairn in SCR. V-Rocks VR are an accurately engineered set of heavy (up to 1 tonne) rocks that act as back V-sights for Solstitial and Equalnight Sun Rises and Sets.

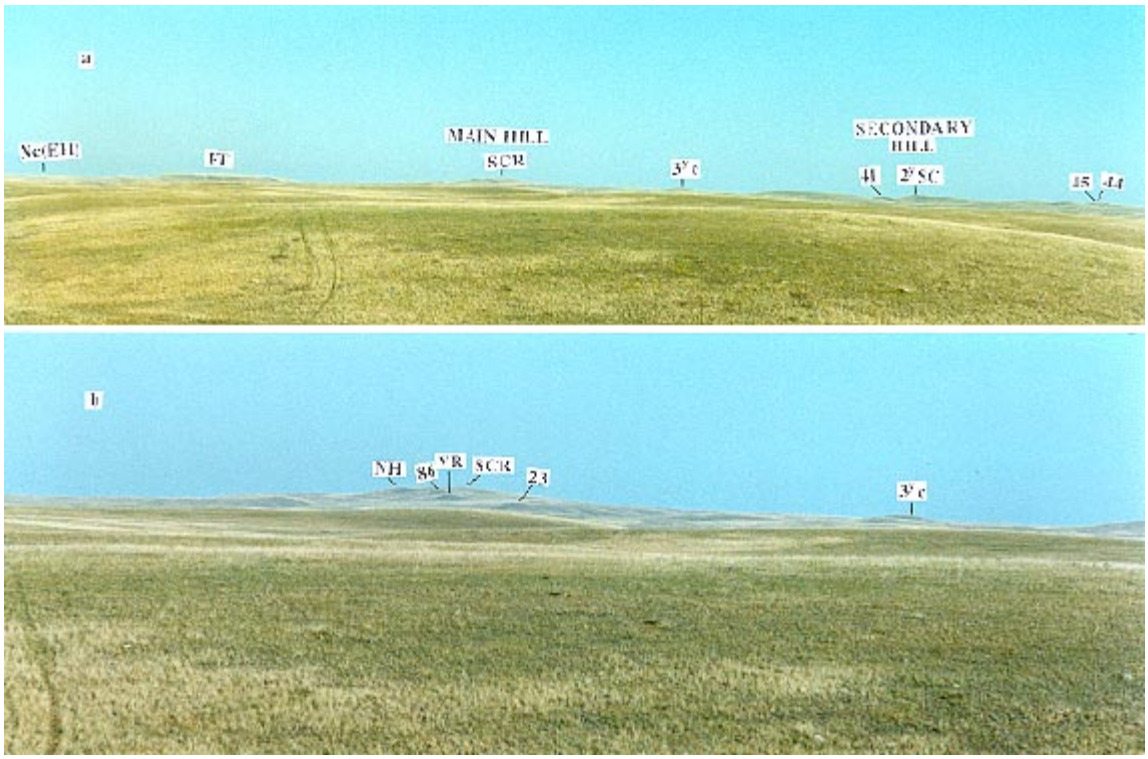

Figure 2. View of the central portion of the Sun Temple, from 8 km W by N of the Medicine Wheel (Sun Cairn Ring, SCR). 28 Sept. 1997. (**a**) The distance across the horizon is about 3.9 km, scale 1:14,200; photo no. 2 **1** 0, focal length 80 mm. (**b**) Scale at horizon 1:5,700; photo no. 2 **1** 1, focal length 200 mm. *Nc(EH)*: North cairn, accurately marking North from the East House on the Main Hill. *FT:* Flat Topped hill that has been cleared of rocks. *NH:* North House. *86*: Label number of the rock that is the Equalnight Sun Set back sight to a VR foresight. *SCR:* Sun Cairn Ring (Majorville Medicine Wheel), central structure of the Sun Temple. *VR:* V Rocks (West House), pivot of a Calendar. *23:* Label no. of the cairn foresight that locates the Summer Solstice Sun Rise viewed from back sight 44. *3^{y}c*: Tertiary cairn that links the Main Hill with the Secondary Hill. *41*: Label no. of the back sight for the Summer Solstice Sun to Rise at NH. *2^{y}SC*: Secondary Sun Cairn; this hill contains several structures analogous to those on the Main Hill, but on smaller scale. *45*: Label no. of a shaped rock that

Method

The equipment and technique are described in the preceding paper (Freeman and Freeman 2000).

About 60% of the time cloudy horizons prevent us from seeing the Sun on distant horizons. Some of the sighting lines look uphill, so sometimes the sighting is about a half hour after the true Rise time or before the true Set time. The overall visibility success rate, with one type of line or another being clear, is about 50% of the Rises and Sets.

Pattern recognition has been particularly useful in sorting out elements of our observations, and in indicating where to look in this enormous site. For example, intersecting horizon lines have proved to be significant. Observations along lines shorter than about 500 m need to be made from a rock surface, rather than from my standing position. Three small cairns that make a V have significance, and large white rocks often do.

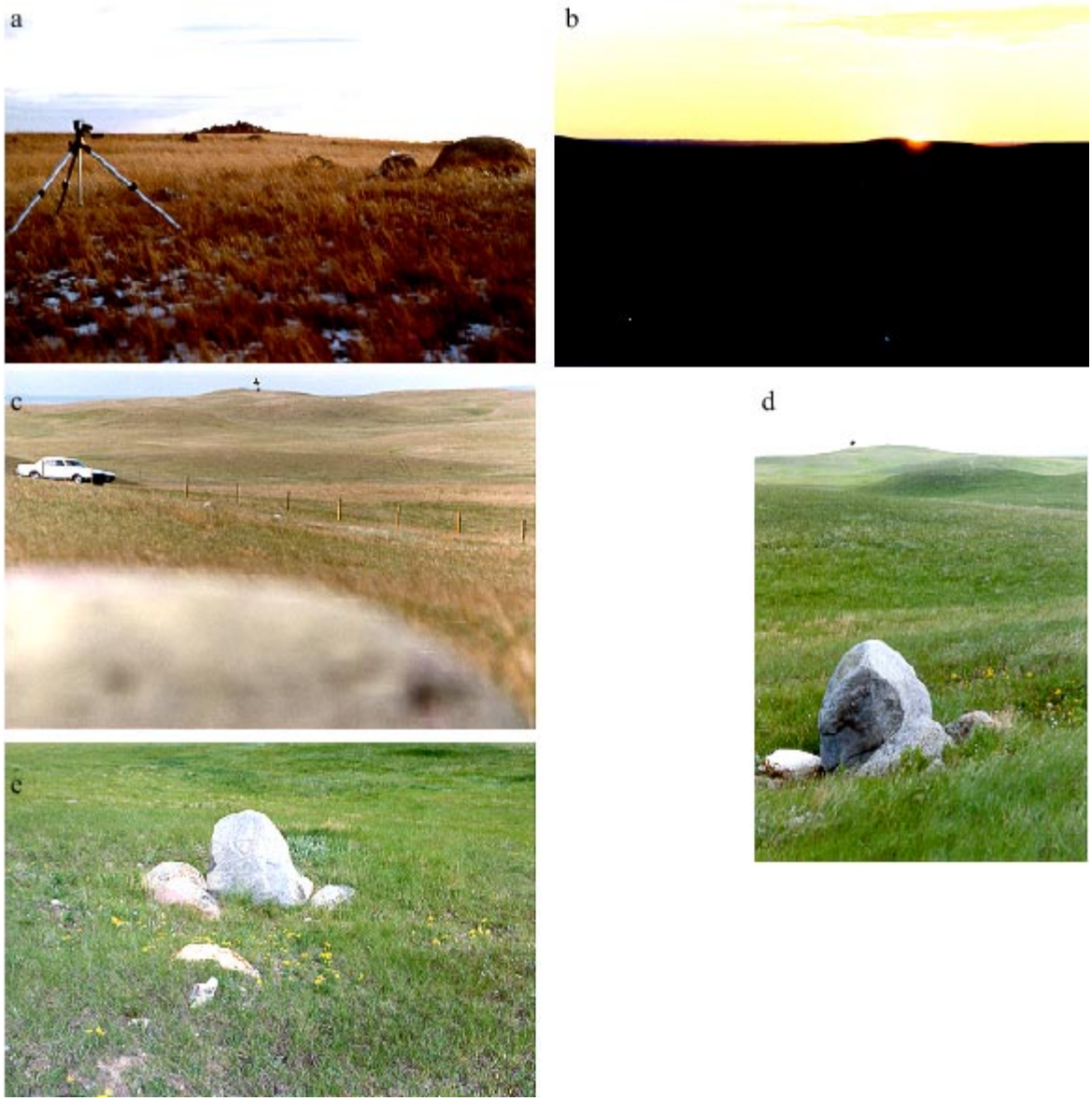

Figure 3. Winter Solstice Sun Set, looking across the top surface of a large, red sandstone in the North House, position NH of Figure 2, to a large, gray granite in position 45 of Figure 2. 19 Dec., 1987, film 2 **2**: (**a**) tripod position for photo (b), Medicine Wheel in photo centre, red sandstone on right, negative no. 32, focal length 80 mm; (**b**) near last flash, 16:26 h, MST, neg. 19, focal length 200 mm; (**c**) 20 June, 1988, photo 2 **3** 2, camera in position similar to that of (b), red sandstone in bottom of photo, Phyl (arrow) is standing 1 m to the left of the gray granite of (d) and (e). 20 June, 1990: (**d**) looking NE to the 1-tonne gray granite foresight and the red sandtone back sight (arrow) 1.9 km away, photo 1 **2** 30, focal length 105 mm; (**e**) looking NW to see that the granite has been shaped (most of the cortex has been removed), photo 1 **2** 34.

Winter Solstice Alignments

Sun Set

The large site contains several Sun Rise and Set alignments for each Solstice and for the Equalnights. The Winter Set line displayed here has as the back sight a half-tonne red sandstone in the North House, 63

Figure 4. Winter Solstice Sun Rise, looking across a black basalt back sight near the Medicine Wheel, to a 27 m long line of heavy rocks, oriented along the line to look like only one rock, 740 m away. 20 Dec., 1988, focal length 200 mm, film roll 2**3**: (**a**) appearance of the sighting line after Sunrise, 11^h15^m, negative no. 35; (**b**) Sun image distorted by mirage, but rounded tip shows position of Sun a few seconds after the actual first flash, 08^h24^m, neg. 7. 19 June, 1988: (**c**) View NW from the rock line foresight to Phyl at the black basalt back sight, focal length 200 mm, neg. 2**2** 3; (**d**) looking NE from gully up to rock line of (c), focal length 80 mm, neg. 2**2** 14.

m from the centre of the Sun Cairn, and as the foresight a one-tonne gray granite in a cairn on a hill 1.9 km to the Southwest.

Figure 3a shows that the camera tripod was low enough to put the top of the back sight sandstone in the bottom of the photo. Figure 3b shows the Sun a few seconds before the last flash at the horizon 1.9 km to the Southwest (actually 232.4°), two days before the Solstice. The Sun Set was only 0.03° away from its Solstice position. Figure 3c shows the alignment of (b), with Phyl standing 1 m to the left of the gray granite foresight.

Most of the cortex of the granite foresight was removed, so we conclude that the elegant shape of the rock was manufactured (Figs. 3d and 3e).

Sun Rise

The back sight is a striated black basalt; the foresight is a 27 m line of heavy rocks along the Sun Rise direction 740 m away, so the line appears as a single rock (Fig. 4a).

On the morning before the Solstice in 1988, an atmospheric inversion caused a mirage that gave a "false rise" (Freeman and Freeman 1998). The true first flash occurred about 15 seconds before Figure 4b, in which the sharp, rounded upper edge of the Sun is visible.

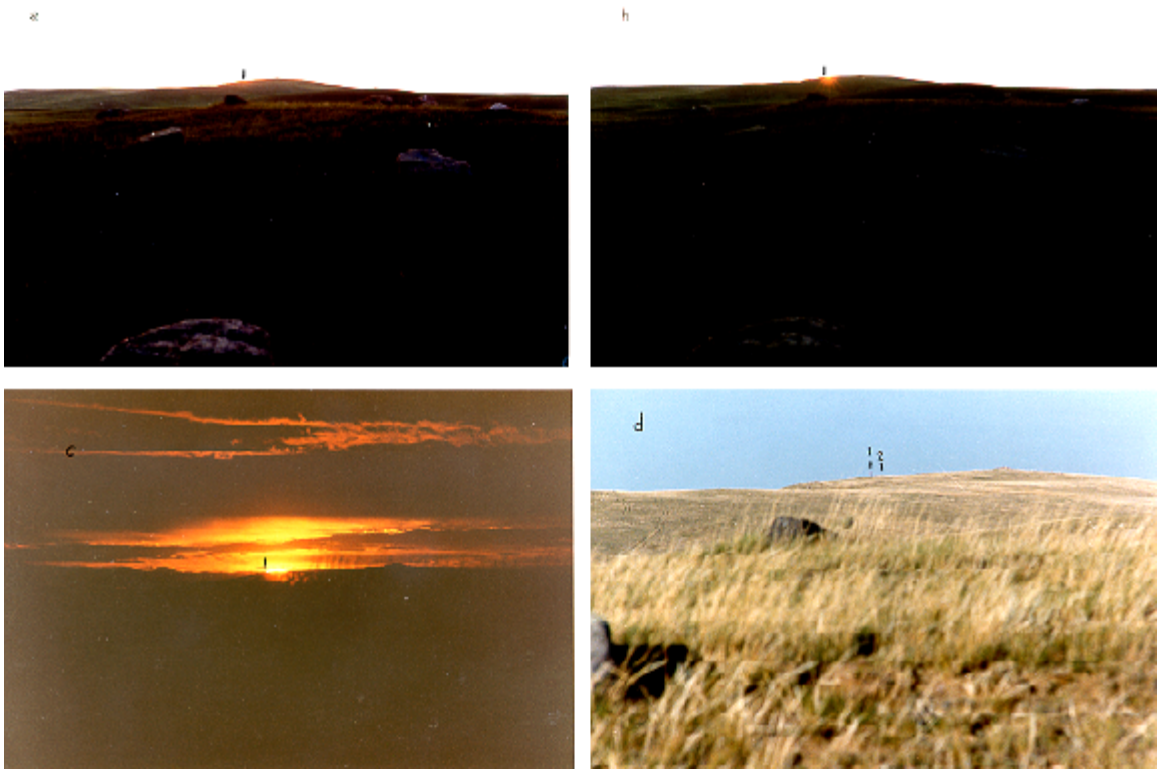

Figure 5. Sun Rise near a Summer Solstice, looking from 41 to NH in Figure 2. (**a**) and (**b**) focal length 50 mm; times 05^h08^m and 05^h11^m MDT, 17 June, 1984, three days before Solstice; Sun is 0.05♈ to right of Solstice position. (**c**) and (**d**) focal length 200 mm: time 05^h15^m MDT, 22 June, 1987 (one day after Solstice Sun 0.005♈ right of Solstice position), and 18^h, 23 Sept., 1987, respectively. In (a)-(c) ticks mark the position of the large, black granite in NH of Figure 2. In (d) Phyl (1) is standing on the black granite; 2 marks the red sandstone, the top of which is shown at the bottom of Figure 3c.

Figure 4c looks NW along the foresight rock line to Phyl at the basalt back sight, 740 m away.

The rock line is on the edge of a gully that leads down to the Bow River. Figure 4d looks NE from the gully to the rock line foresight. During the next century or two the bank could erode enough to undercut the rocks. There are indications, too subtle to recount here, that the rock line might have been placed there between 2000 and 3000 years ago.

Summer Solstice Alignments

Sun Rise

As the season changes from Winter Solstice to Summer Solstice, the Sun Rise point moves Northerly. The most Northerly contact point of the Northerly edge of the Rising Sun, viewed from the centre of the rock emplacement 41 in Figure 2, is a 300 kg black granite in NH, 1.3 km away (Fig. 5). The position of the black granite is indicated by ticks in Figure 5. The distance between the black granite and red sandstone (ticks 1 and 2 in Fig. 5d) is 4 m, 0.3 Sun diameter in the photo. The small nipple on the hill peak is the Sun Cairn.

Figure 6. Summer Solstice Sun Set line, from NH to the cairn on top of a conical mound 920 m away. 21 June, 1990, focal length 105 mm: (**a**) the position of the last flash is marked, $21^h44.8^m$ MDT, photo no. 1 **6** 23; (**b**) looking SE back along the line, from the cairn on the conical knoll to the NH (tick), 11^h, photo 1 **4** 23.

Sun Set

The line shown in Figure 6 is from a back sight in NH to a cairn on a conical knoll 920 m away. I think that dirt was moved to attain the exact position and conical shape of the knoll when viewed from this direction. Indeed it appears that dirt was moved at many locations to modify the land contour when viewed in a particular direction.

Discussion

Solstice Observations

The weather at the MMW Complex site during the visits in December 1987 and 1988 was pleasant, with little snow and temperatures near -5ϒ to -10ϒC. Geese flew Southeasterly over the site, at heights of about 100 m, at dusk during both visits. They might have been returning to the river from feeding grounds Northerly and Westerly. The mean temperature in this area 5000 and 1000 years ago was warmer than now (van Andel 1994). Thus the goose bones in the central cairn of the Medicine Wheel (Calder 1977; Vickers 1988) could have been offerings made in Winter as well as in any other season.

Three of the four Solstitial Sun alignments presented in this paper had the back- or foresight in the North House on the Main Hill. These were selected to indicate some of the intricacy of the rock patterns in the Sun Temple near Majorville.

The quality of the science exercised by the builders of this ancient Temple has been severely underestimated. I will also state, without amplification, that the usefulness of information obtained by ethnological inquiry about Sacred Matters has been seriously overestimated.

Age

The Southerly 60% of the large Sun Cairn in the Medicine Wheel was excavated in 1971 (Calder 1977). The cairn consists of eight layers of rocks separated by seven layers of dirt. Some of the artifacts in the lower layers are Oxbow, which indicates a beginning of the cairn in about 5000 BP.

The Solstitial Rise and Set directions have drifted 1.2ϒ toward due East and due West during the last 5000 years, due to the gyroscopic precession of the Earth's rotational axis. The present accuracies of the lines shown here indicate that they were adjusted during the last thousand years. Our ongoing study will look for evidence of adjustments over the millennia.

An appropriate time window to be considered for the evolution of the MMW Complex is 6000 to 200 years BP.

Present Shape of the Sun Cairn

The rocks of the excavated part of the cairn (Calder 1977) were not returned to the cairn in any particular order, except that larger ones are on top (J.M. Calder, personal communication 1987). The present peak of the cairn is 0.7 m North of the present centre of the 9 m diameter cairn, and the re-piled Southern 60% is somewhat lower than the original configuration. A line joining the East and West Rays of the Ring passes through the centre of the Ring and 0.6 m South of the present centre of the cairn.

Intricacy of the MMW Complex

The intricacy of the many boulder configurations and topological patterns in the large MMW Complex indicate that the site evolved because of its special attributes, including its geographic location. For example, Figure 1 shows that the angle between the Summer Solstice Sun Rise and the Summer Moon Southern extreme Rise line is 90ϒ, equal to the angle between the sacred Cardinal Directions. Another example is that the Northern and Southern extremes of the Winter and Summer Moon Rises, respectively, coincide with strong bends in the river when viewed from the Sun Cairn (Fig. 1). These extremes of the Moon Rise lines occur once each 19 years.

Recommendation of Protection

Our repeated requests to enlarge the designated area (protected by Alberta Government legislation) led in 1987 to an increase from 0.16 km^2 to 0.65 km^2. Since then we have strongly urged the Archaeological Survey of Alberta to further designate all of section 3-19-18-4, and to proceed toward designation of the East half of section 4, and all of sections 2, 3, 10, and 11 of twp 19 rg 18 West of the 4th Meridian, plus the steep banks of the Bow River in sections 24, 13, 12, and 1 of 19-18-4, and those in sections 35, 34, 27, 26, 25, and 24 of 18-18-4. So far, they have refused.

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Gordon R. Freeman and Phyllis J. Freeman
Chemistry Department, University of Alberta, Edmonton, Alberta T6G 2G2