Scattered across the upper Great Planes and into Alberta, Canada rings of stones bare mute testimony to ancient rituals and purposes long since lost in legend and folklore.

For 4000 years, some have watched the passage of time and a million sunsets.

The Big Horn medicine Wheel in Wyoming has 28 spokes, the same number used in the roofs of ceremonial lodges. The wheel was built between 1200 and 1700 AD. The central cairn is the oldest part. Excavations have shown it extends below the wheel and has been buried by wind-blown dust. Alberta has about 66% of all known Medicine wheels (46) which suggests that Southern Alberta was a central meeting place for many Plains tribes who followed Medicine Wheel ceremonies (usually on the Summer Solstice - June 21st).

At the center of the wheel there is a raised central cairn, and several others on the periphery of the wheel. These have been alleged to have astronomical alignments. Astronomer John Eddy suggested that a line drawn between the central cairn and an outlying cairn at the Bighorn Medicine Wheel pointed to within 1/3 of a degree of the rising point of the sun at the summer solstice.

The actual astronomical purpose of the design of these wheels remains controversial. The design may also have assisted in the performance of specific rituals and ceremonies that have been lost to us. The 28 spokes could indicate the lunar month, or the length of the female menstrual cycle.

Education Standards Satisfied by This Activity

(See Benchmarks for Science Literacy, Project 2061, AAAS)

1c – The Scientific Enterprise

G6-8 "Important contributions to the advancement of science, mathematics and technology have been made by different kinds of people, in different cultures, at different times.

G9-12 "The early Egyptian, Greek, Chinese, Hindu and Arabic cultures are responsible for many scientific and mathematical ideas and technological innovations.

2a – Patterns and Relationships

G9-12 "Although mathematics began long ago in practical problems, it soon focused on abstractions from the material world, and then on even more abstract relationships among these abstractions.

3A - Technology and Science:

G6-8 "Engineers, architects and others who engage in design and technology use scientific knowledge to solve practical problems. But they usually have to take human values and limitations into account as well.

4B – The Earth

G6-8 "Because the Earth turns daily on an axis that is tilted relative to the plane of earth's yearly orbit around the sun, sunlight falls more intensely on different parts of the Earth during the year. The difference in heating produces the planet's seasons and weather patterns.

11B – Models

G3-5 "Geometric figures, diagrams, and maps can be used to represent objects, events and processes in the real world although such representations can never be exact in every detail.

Problem 1 - On the Summer Solstice, the azimuth angle of the rising sun is 55 degrees, and the setting sun is at 304 degrees. The Spring Equinox rising sun occurs at 84 degrees, and the setting sun is at 276 degrees. Viewed from the center of the Medicine Wheel, how do these events match up with the azimuth angles of the cairns (white spots) located around the circumference of the Medicine Wheel?

Problem 2 - Most ancient peoples were acquainted with the North Star. In the medicine Wheel, can you identify the cairns that may represent the four cardinal points?

Problem 3 - Can you create your own backyard medicine wheel that gives the cardinal compass points, and marks the viewing direction of the rising sun at the Spring Equinox…..or some other date important to you?

To find the azimuth of the sun for any date and location, visit the NOAA solar calculator at **http://www.srrb.noaa.gov/highlights/sunrise/azel.html** and enter the location of your city or town.

Select the first day of spring, March 20, and select a local time near sunrise on that day. Then look at the data field that gives the solar azimuth.

For example, selecting 'Boston Massachusetts', and entering March 20, 2010, at a time of 5:49 AM gives an azimuth of 89.6 degrees

Sunrise occurs when the elevation angle is near-zero.

Problem 1 - The figure below sows the azimuth lines drawn for the seven easily-seen cairns (white spots along circumference of circle)

Answer: The cairns are located at approximately 20 ,90 ,138, 171 ,236, 270 and 296 degrees clockwise around the circle. The setting sun at the summer solstice (304 degrees) is very close to Cairn G (290 degrees). The rising sun at the spring equinox (84 degrees) is very close to Cairn B (90 degrees).

Problem 2 - Answer: Cairn A is close to due-north; Cairn B is close to due-East; Cairn D is close to due-south, and Cairn F is close to due-west.