

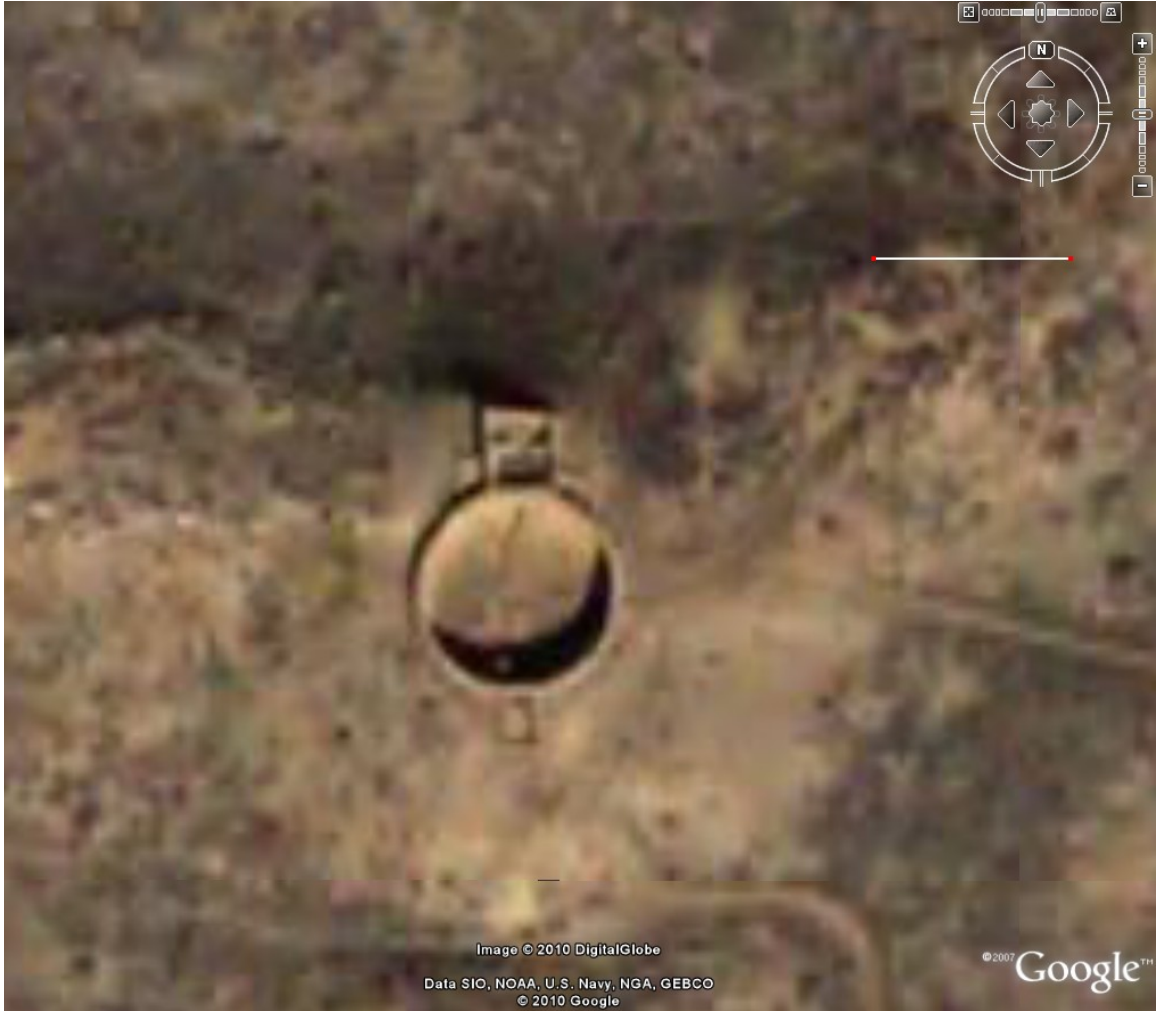


American Indians across the Southwest were careful, and ingenious, observers of the sun for both religious and agricultural purposes. We can admire them for their cleverness in applying this knowledge to enhance their own survival in a, largely, unforgiving environment. The first thing one notices about Chaco Canyon and neighboring American Indian sites throughout the Southwest, is the dryness of the climate. Yet those who lived here grew crops with enough bounty to feed tens of thousands.

Because the growing season is so brief, and book-ended by long months with little or no rainfall, agriculture must have been a major undertaking which took advantage of all the clues provided by nature as to when to plant crops. It is perhaps not surprising that so many religious and ceremonial structures seem to have some type of solar alignment built into their architecture. What better way to keep track of the seasons, and to keep a calendar updated, than to watch for a sunrise or sunset on certain special days of the year. The sun also played a major role in most American Indian religious practices. Casa Rinconada is one of five great kivas in Chaco Canyon - 60 feet in diameter and 15 feet deep. Great kivas are found in nearly every major Anasazi community from about AD. 900 to 1200, with some appearing as early as A.D. 500. Casa Rinconada was probably built between 1070 and 1110 AD.

The above satellite image found with GOOGLE Earth shows Casa Rinconada as the circular feature to the left of the center. The horizontal line indicates a distance of 20 meters, and the circle indicates the four geographic directions clockwise: north (top) east, south and west. The symmetry axis defined by the two T-shaped doors is aligned with the North-South line to within 20 arcminutes. The small niches lining the interior wall are equally spaced and positioned so that lines defined by opposing pairs of niches all have their center within 4 inches of the kiva center, which also indicates that the kiva walls depart very little from a perfect circle. The circular masonry foundation sockets for the four roof posts on the kiva floor form a square also centered on the kiva center within 4 inches, with sides oriented to within 30 arcminutes of either the N-S or E-W directions.

Shortly after sunrise on the summer solstice, June 21, a beam of sunlight shines through a lone window on the N-NE side of the kiva and moves downward and northward until it illuminates, on the interior West wall, one of the five larger, irregularly spaced niches in the kiva. This has been hypothesized to be an intentional construct, aimed at marking and celebrating the summer solstice (possibly involving the placement of offerings in the niche).



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 - At the present time, the azimuth of sunrise on the summer solstice, at the location of Casa Rinconada, is 60.6 degrees. Using the satellite image of Casa Rinconada as a guide, draw a scaled version of Casa Rinconada using the 20-meter line and compass circle as a guide.

Problem 2 - Draw a line through Casa Rinconada with an azimuth angle of 60.6 degrees that represents the rays of the sun at sunrise entering the circle and illuminating a spot on the inner wall surface.

The picture below shows the Summer Solstice sunlight illuminating the niche in Casa Rinconada (Courtesy Troy Cline)



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