

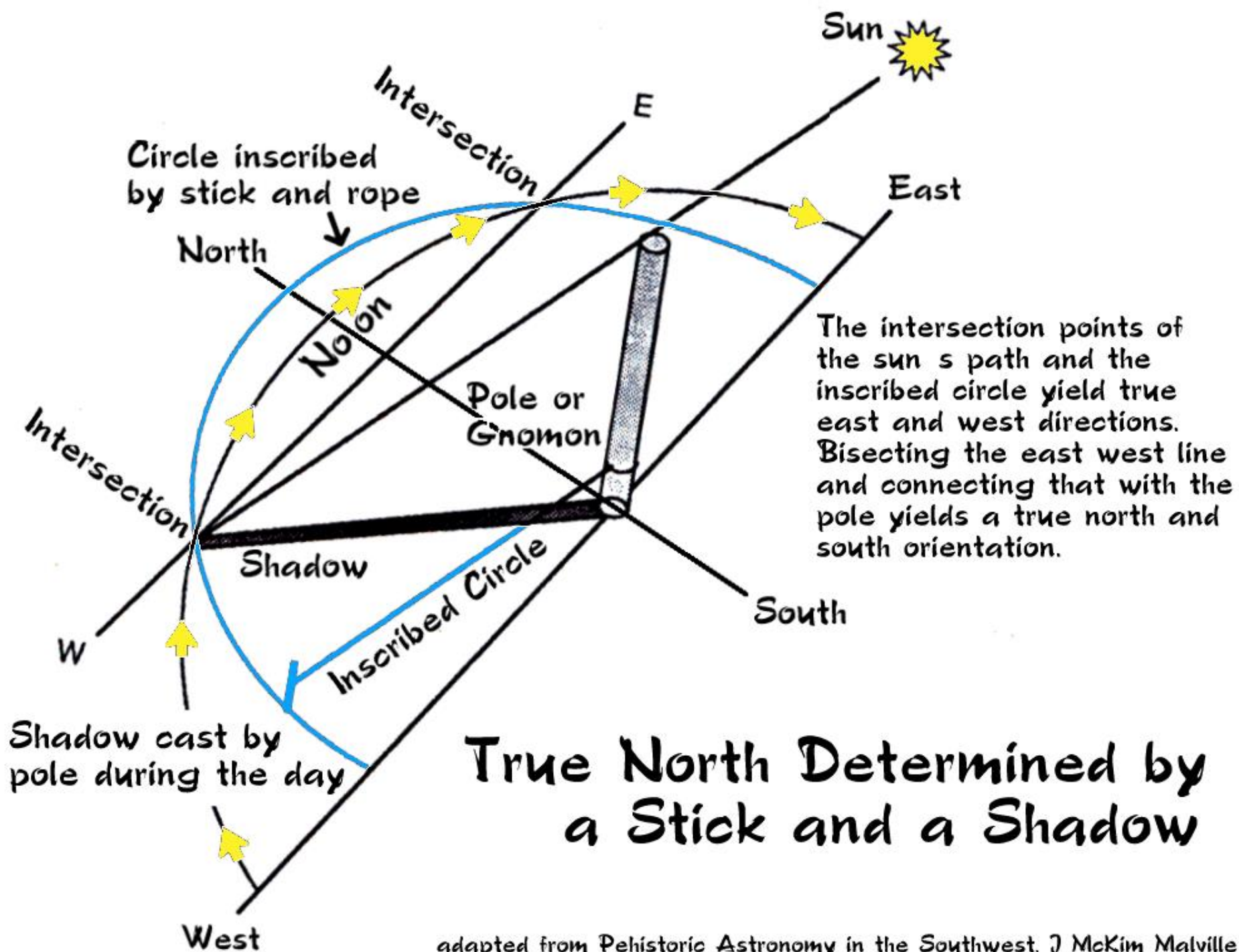
Archaeoastronomy

Archaeology

Astronomy

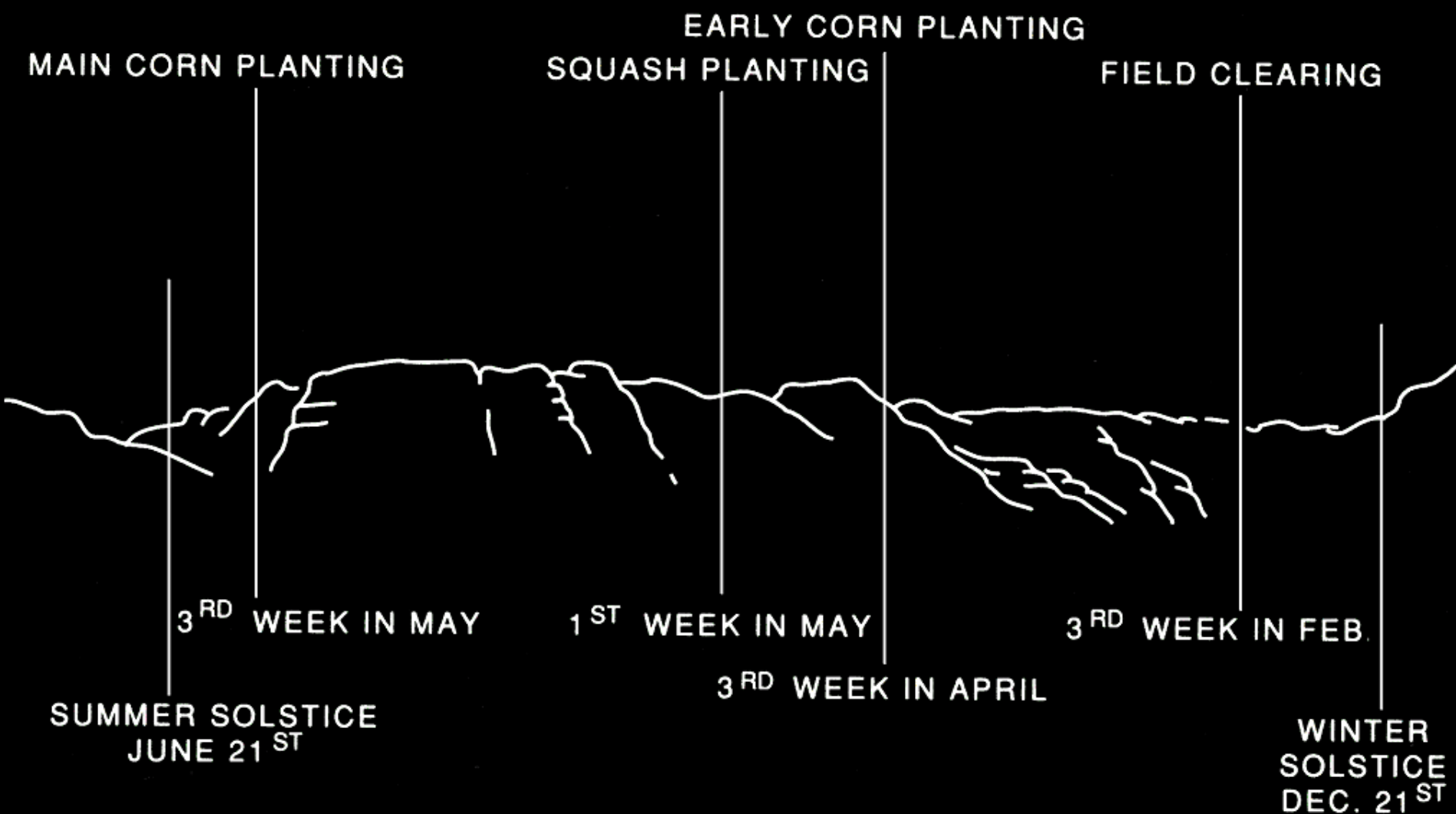
Save Your People

Win That Girl



Hopi Solar Calendar

HORIZON CALENDAR, DECEMBER TO JUNE, WALPI.



Serendipitous Bryce Discovery



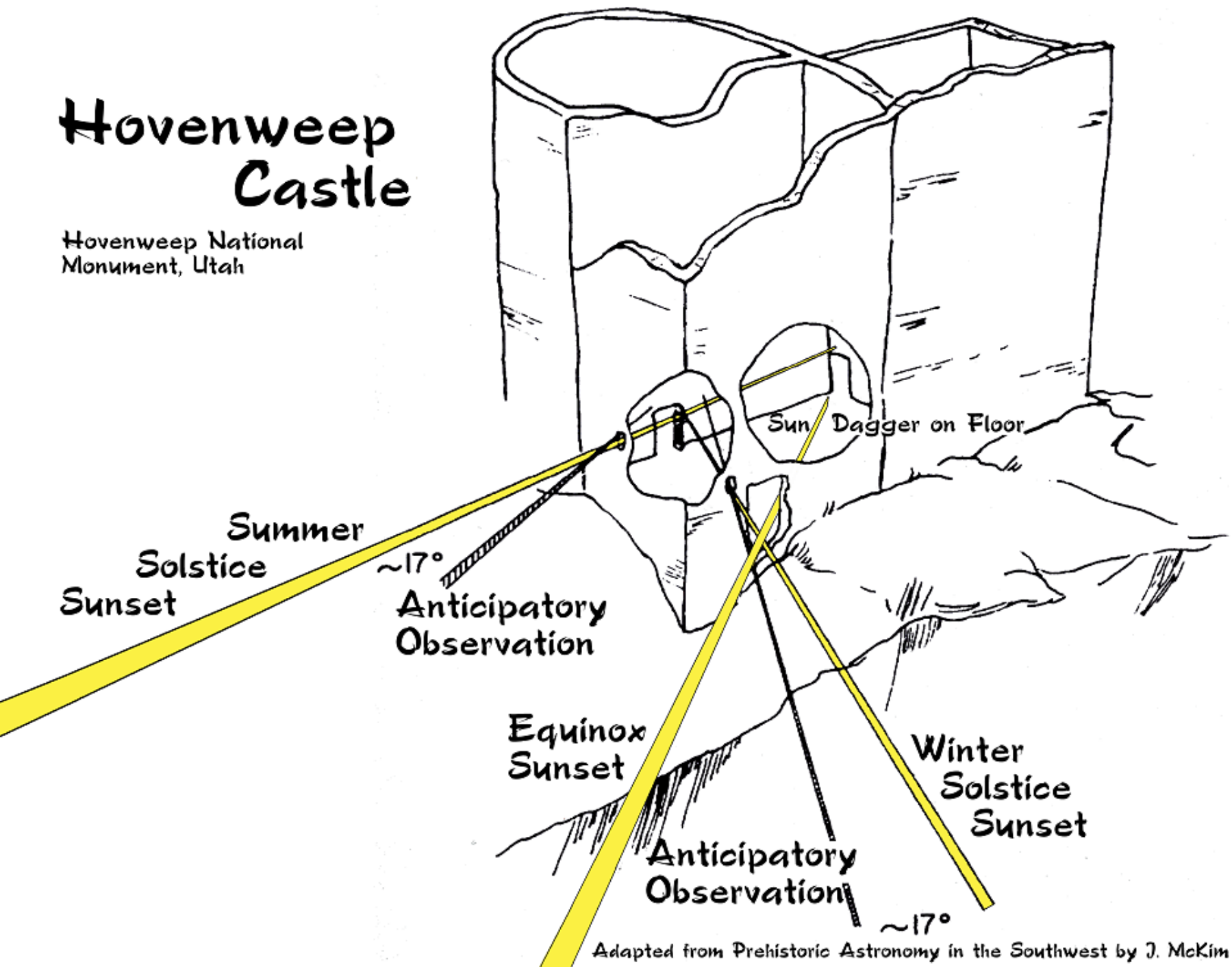
Hovenweep National Monument, Southeastern Utah



Hovenweep Castle

Hovenweep Castle

Hovenweep National Monument, Utah





Hovenweep Castle

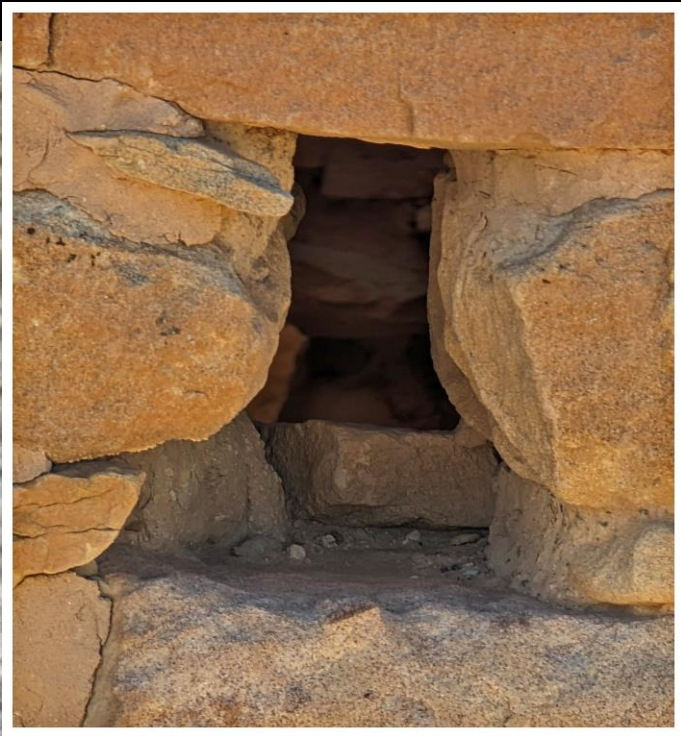
Summer Solstice Port

Unit House 1

Winter Solstice Port

Vernal Equinox Doorway

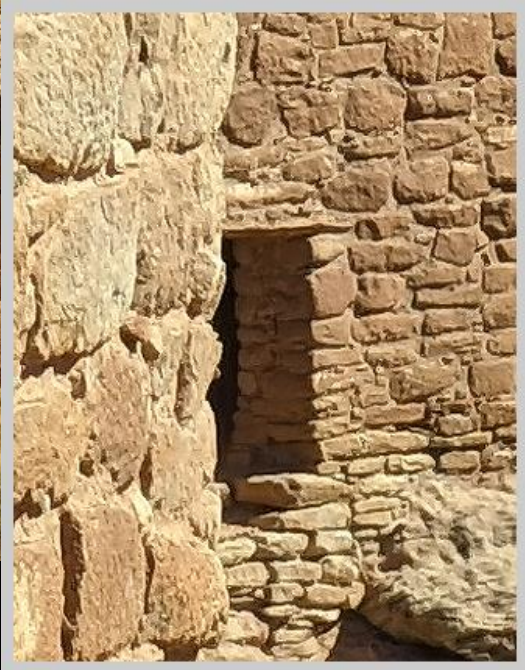
Hovenweep National Monument, Utah



Summer Solstice Port

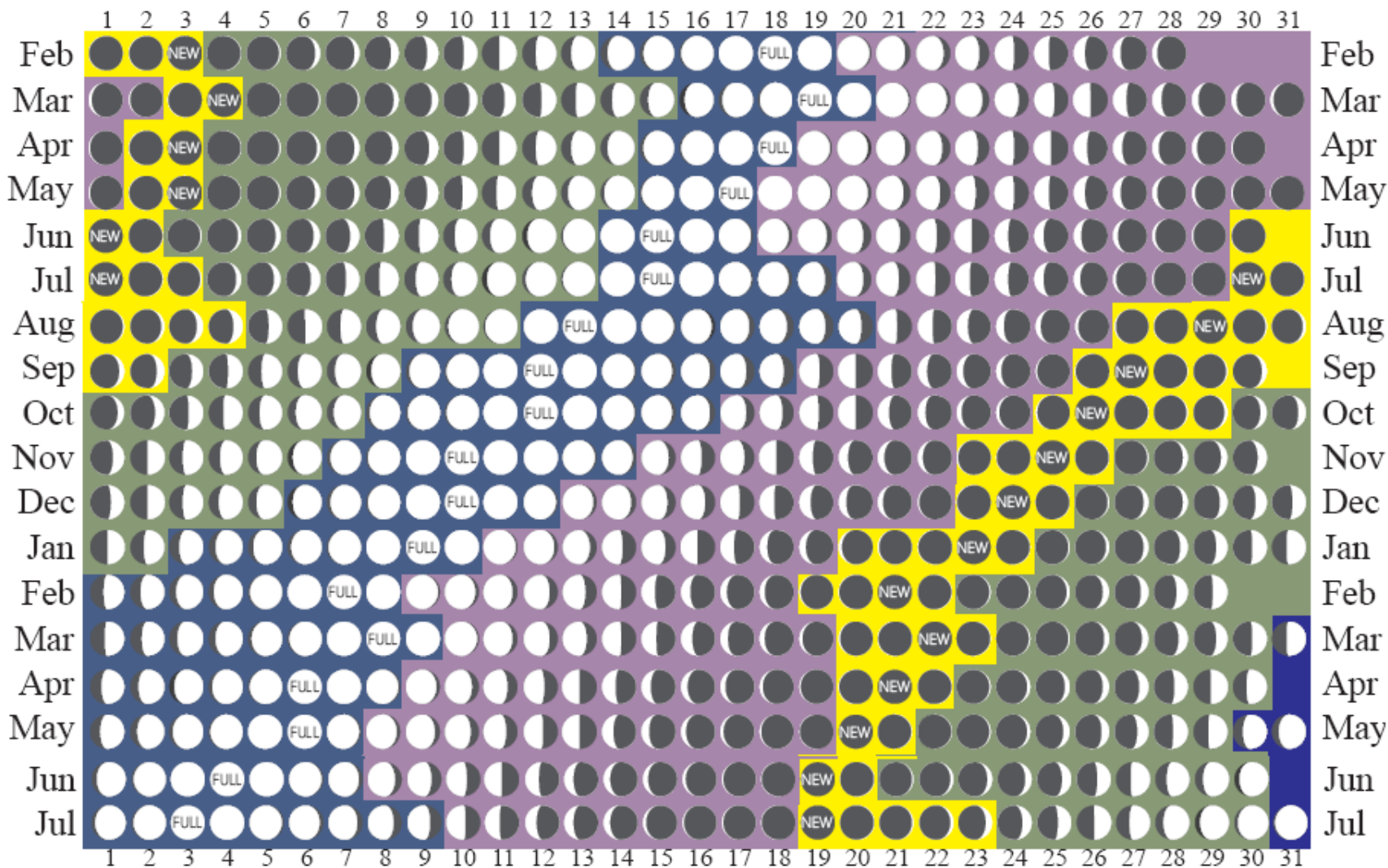


Unit House 1 cuts off the sun for a Precision Vernal/Autumnal Equinox Observance



Lunar Calendar Problems

Phases of the Moon 2010 - 2011

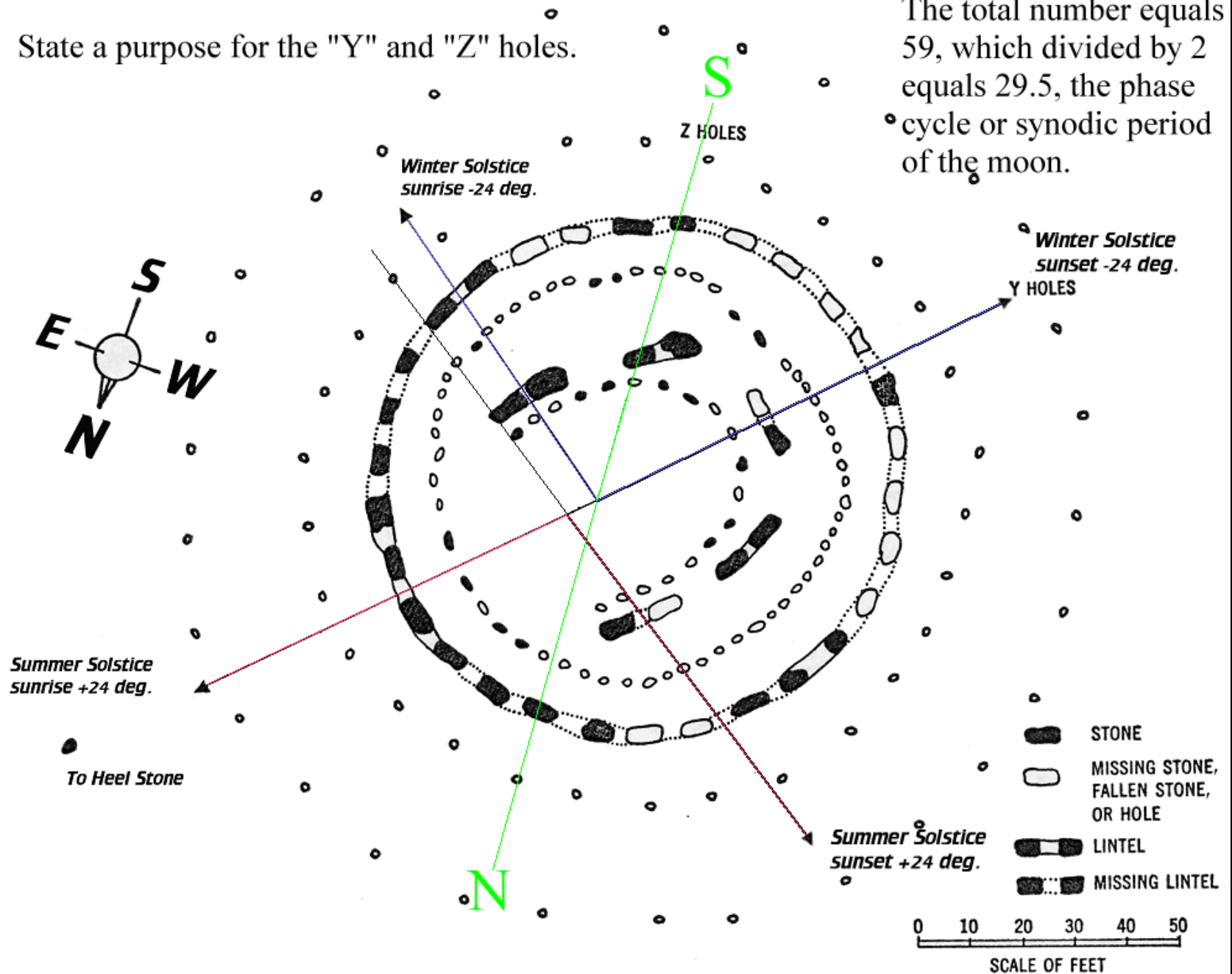


Stonehenge

Stonehenge Complete, circa. 2600 BC

State a purpose for the "Y" and "Z" holes.

The total number equals 59, which divided by 2 equals 29.5, the phase cycle or synodic period of the moon.



Stonehenge Alignments

Winter Solstice
Sunrise

Winter Solstice
Sunset

Summer Solstice
Sunrise

Summer Solstice
Sunset

To Heel Stone

















Image by Joe





Image by Joe Wineburgh



Image by Joe Wineburgh









↑ Stonehenge



Stonehenge in Australia



Winter Solstice Sunset



Summer Solstice Sunrise





© David Savage

Challenge

Alliance, NB

A wide-angle photograph of a street intersection in Alliance, Nebraska. The foreground is dominated by a brick-paved road. A white SUV is driving through the intersection. On the left, a building houses a First National Bank with a sign that also says 'ONLINE BILL PAY'. An American flag is visible on a pole. On the right, a brick building is labeled 'MASONIC CENTER'. The sky is clear and blue. The text 'Alliance, Nebraska' is overlaid in white in the lower center of the image.

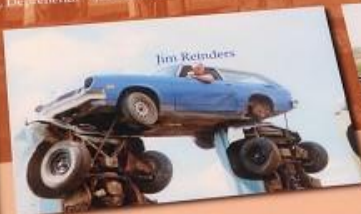
Alliance, Nebraska



Welcome to Carhenge

Your first question upon encountering Carhenge might be Why? But creator Jim Reinders' answer would simply be Why not? After spending seven years of his career as a petroleum engineer in England, Reinders returned home inspired by a grand idea. He would create a Stonehenge replica - "Stonehenge West," for his hometown of Alliance, Nebraska. With no giant slabs of stone present in the area, Reinders decided on a new medium for his sculpture - cars. Cars would be readily available, would be similar in shape and size to the stones of Stonehenge, and the wheels would simplify logistics immensely. The original 25 cars were erected during a Reinders family reunion in 6 days and dedicated on the Summer Solstice, June 21, 1987. "We were able to reduce the time of the original Stonehenge construction by 9,999 years and 51 weeks."

"Plane, Loqui, Diegehendi!" Jim Reinders













Archaeoastronomy: Spotlight on Chaco Culture National Historical Park

Fajada Butte

Spanish for "banded or braided"



Fajada Butte from about 15 miles



Thirteen miles of dirt road into Chaco Canyon



Fajada Butte from about two miles
distant



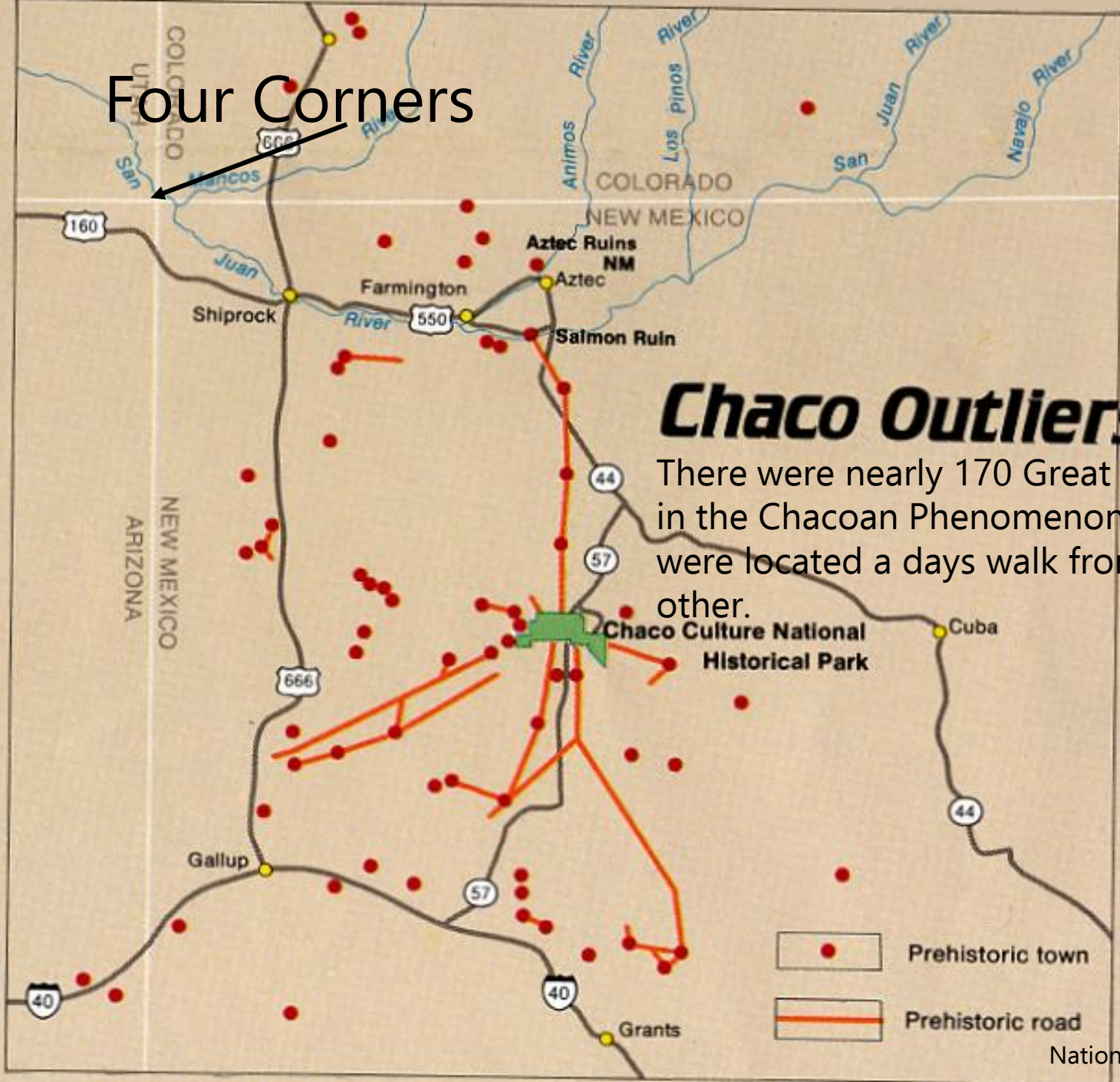
Huerfano Mesa



Ancestral Puebloan Culture reached its highest level of achievement in the Four Corners region of the US during the mid-to-late 11th century.



Four Corners



Chaco Outliers

There were nearly 170 Great Houses in the Chacoan Phenomenon; many were located a days walk from each other.

Nine Mile Loop Road



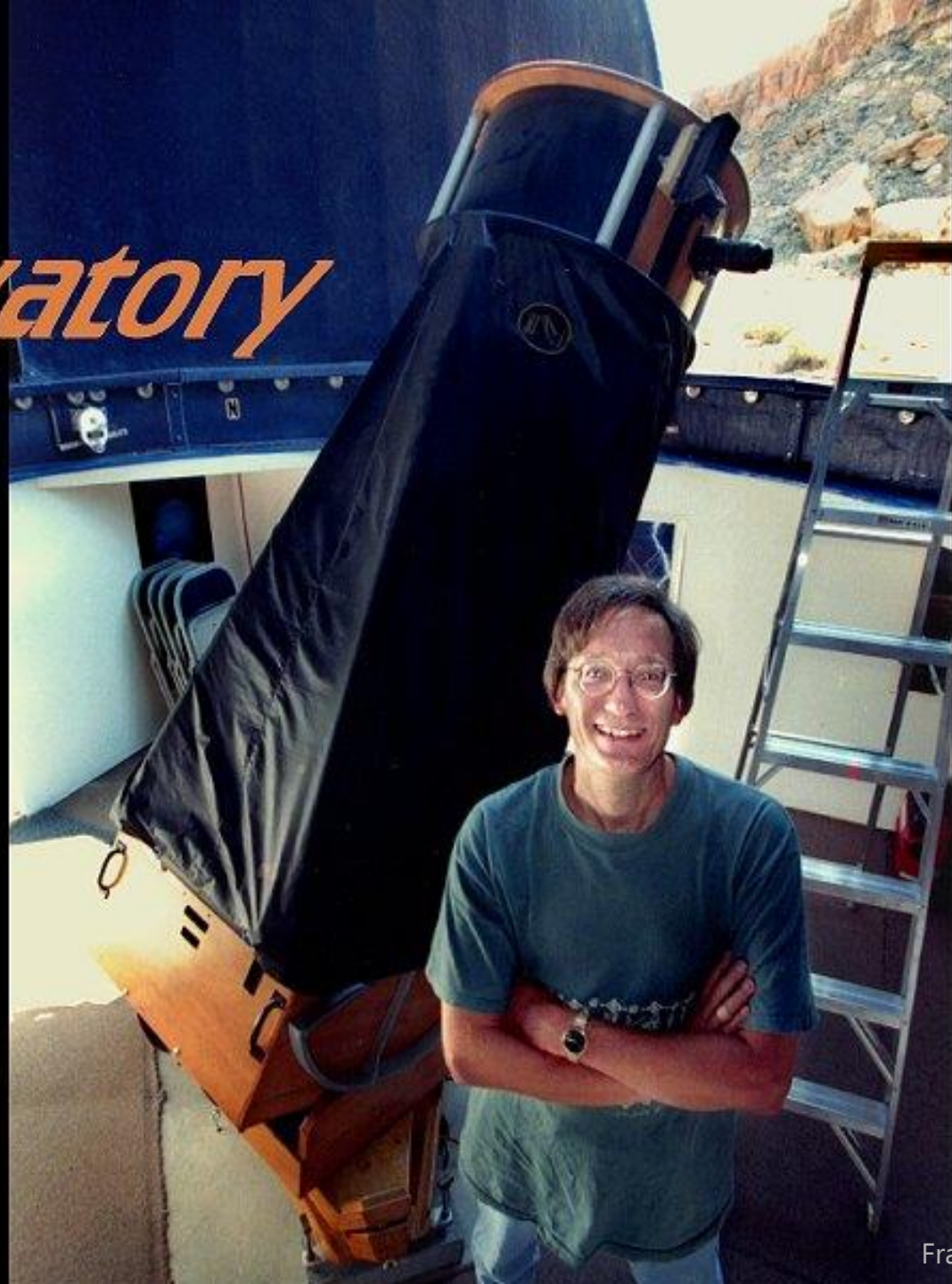
Loop Road Chaco Culture

Visitor Center at Chaco Culture



Chaco *Observatory*

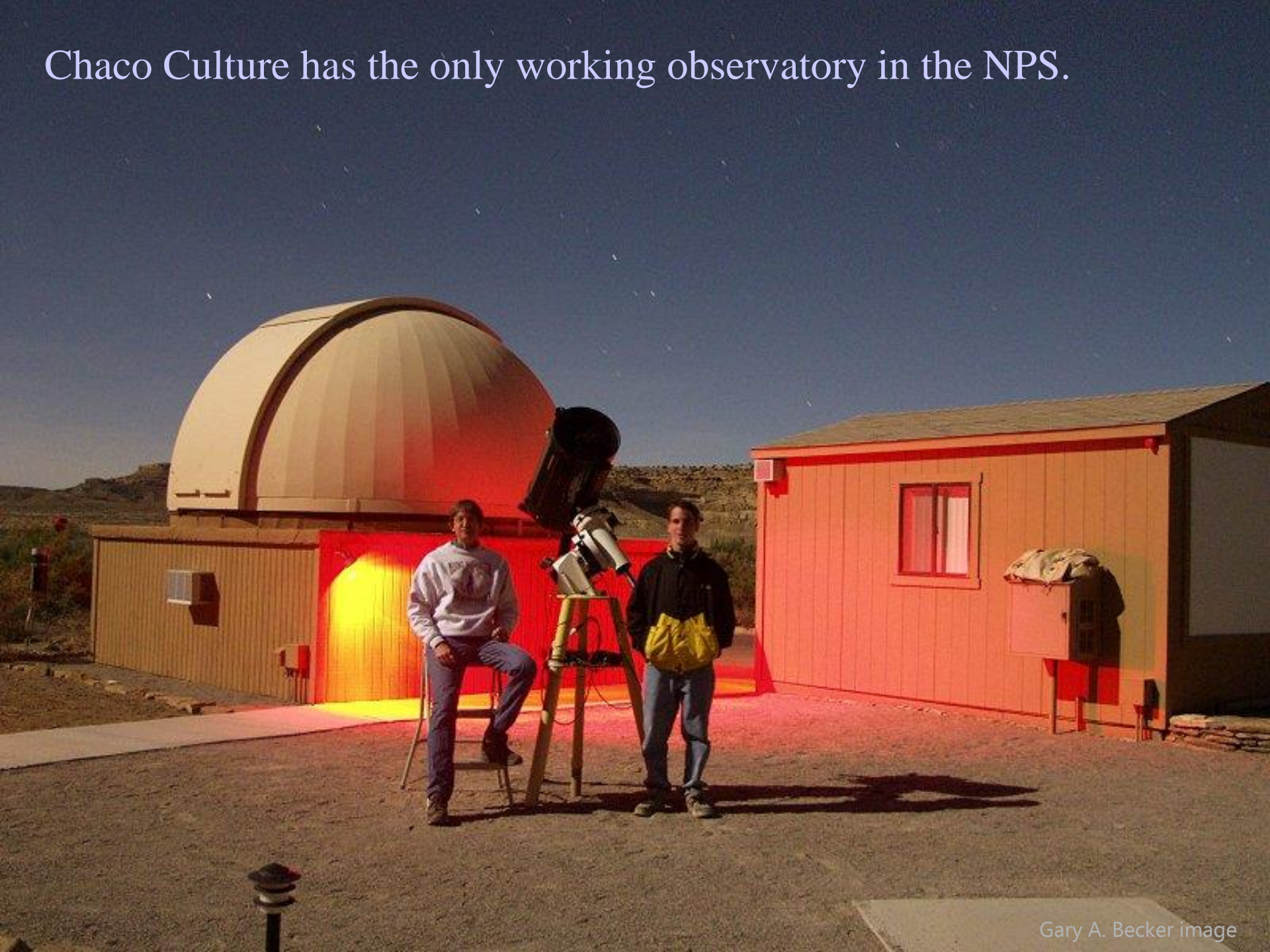
The tradition of observing the day and nighttime sky begun by the Ancestral Puebloan People continues into the 21st century at Chaco Culture National Historical Park.



Nighttime observing and ranger talks are a tradition at Chaco Culture



Chaco Culture has the only working observatory in the NPS.



Gallo Campground, May 2012

Venus is about to set.





Chaco Skies... Another reason for visiting the park.

Fajada Butte at Sundown-Chacra Mesa on left

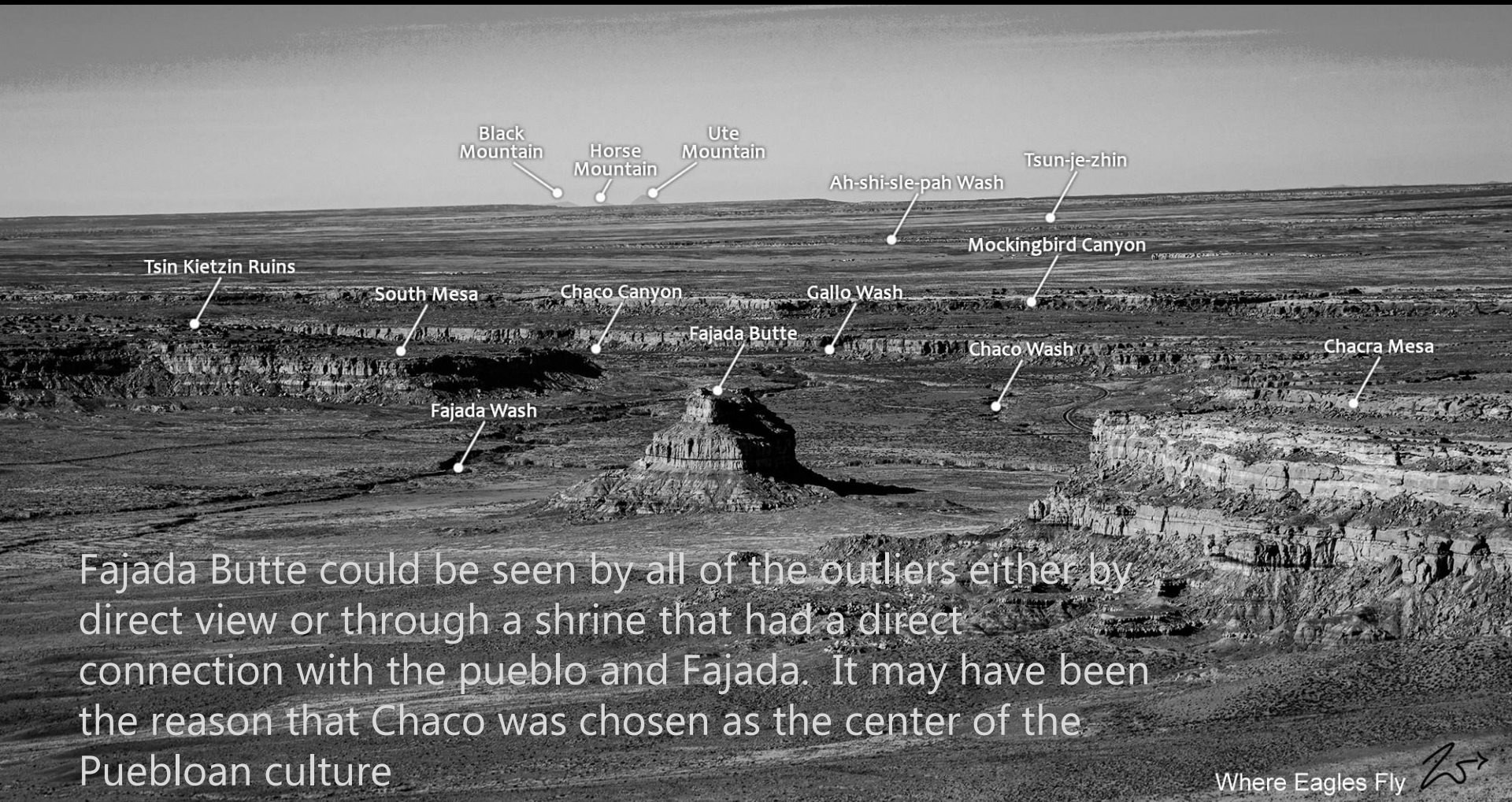




Fajada Butte-Impending Storm



Fajada Butte, looking north



Fajada Butte could be seen by all of the outliers either by direct view or through a shrine that had a direct connection with the pueblo and Fajada. It may have been the reason that Chaco was chosen as the center of the Puebloan culture

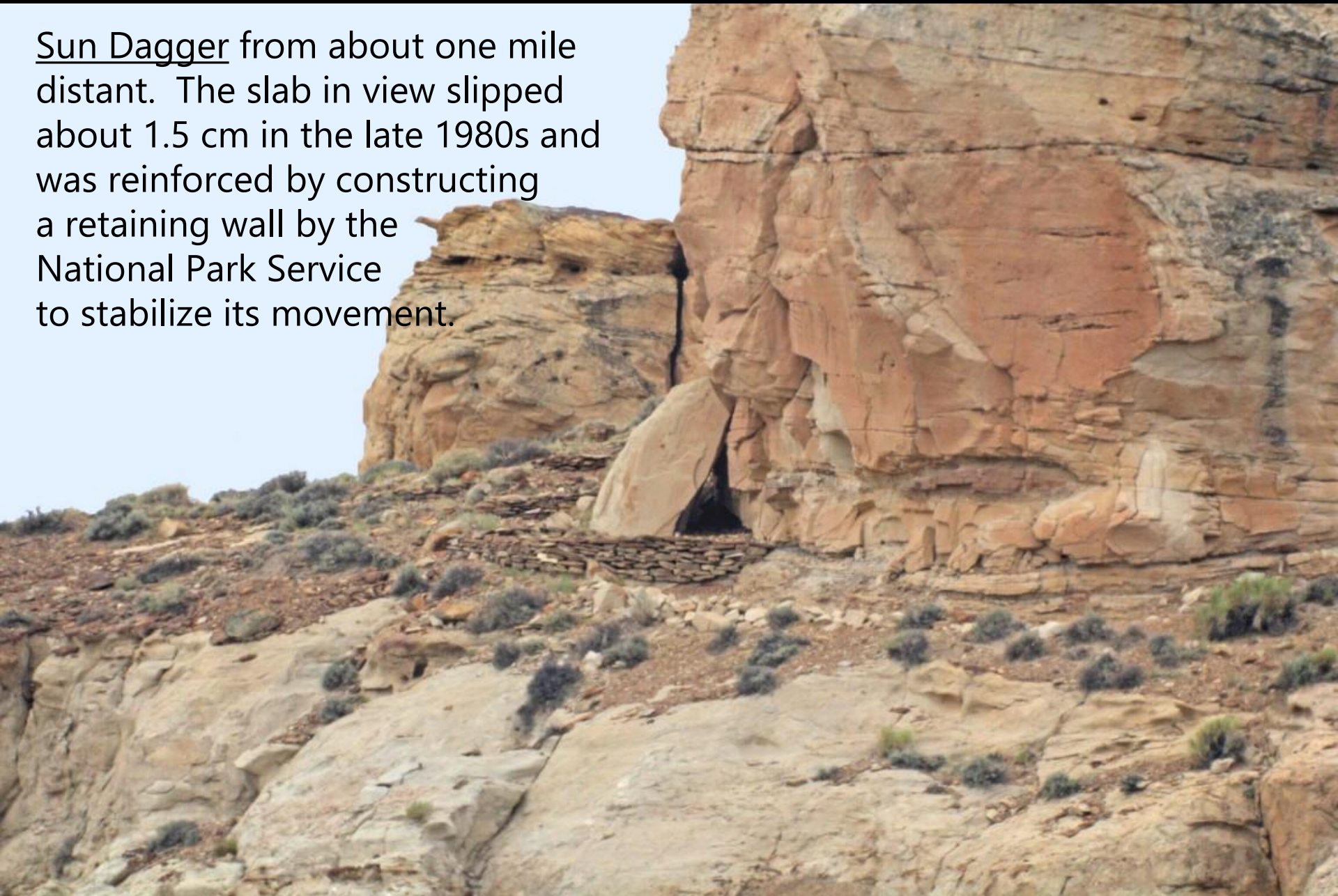
Sunrise... Suggest an astronomical use for Fajada Butte



Fajada Butte *Sun Dagger*



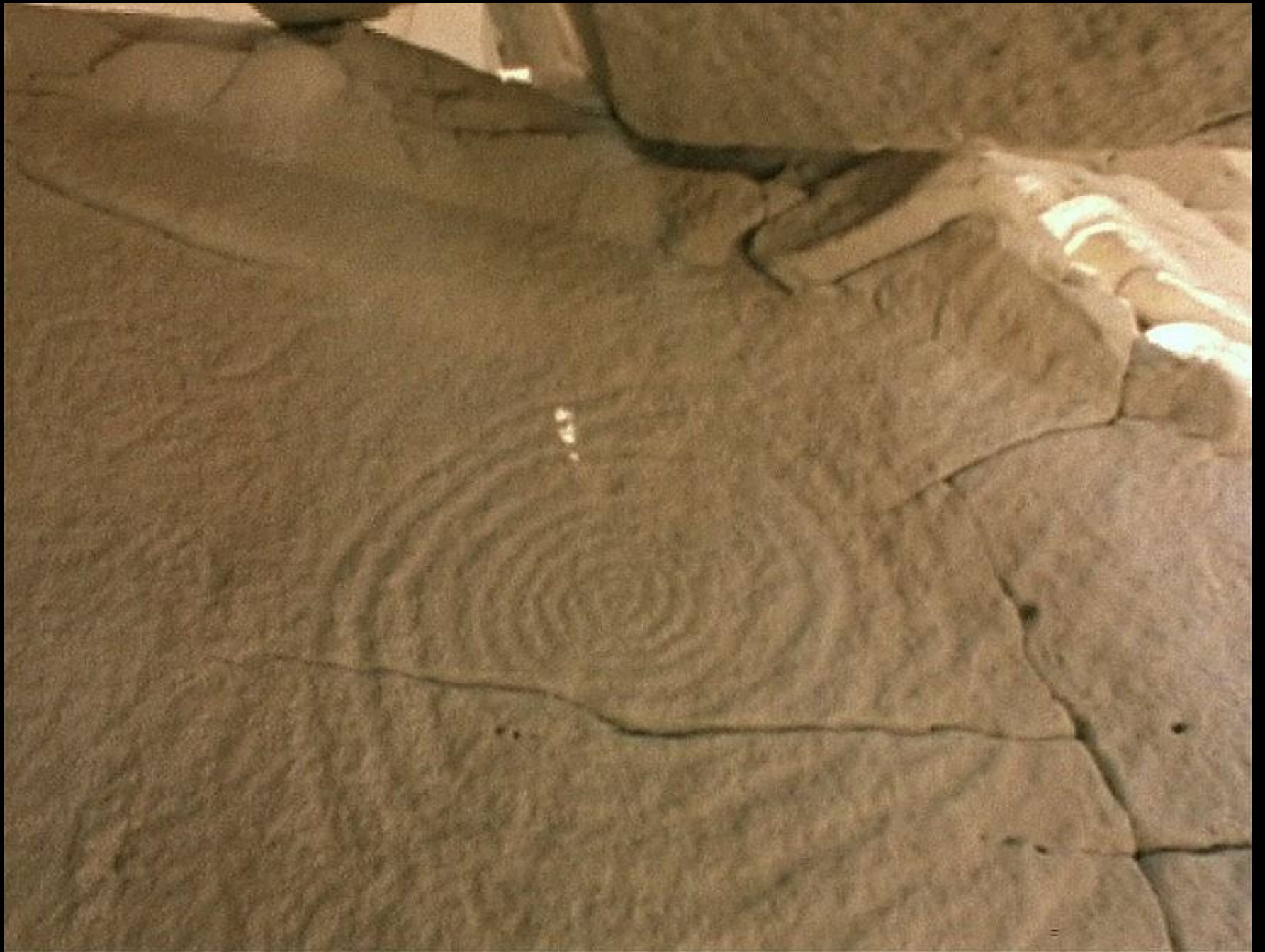
Sun Dagger from about one mile distant. The slab in view slipped about 1.5 cm in the late 1980s and was reinforced by constructing a retaining wall by the National Park Service to stabilize its movement.

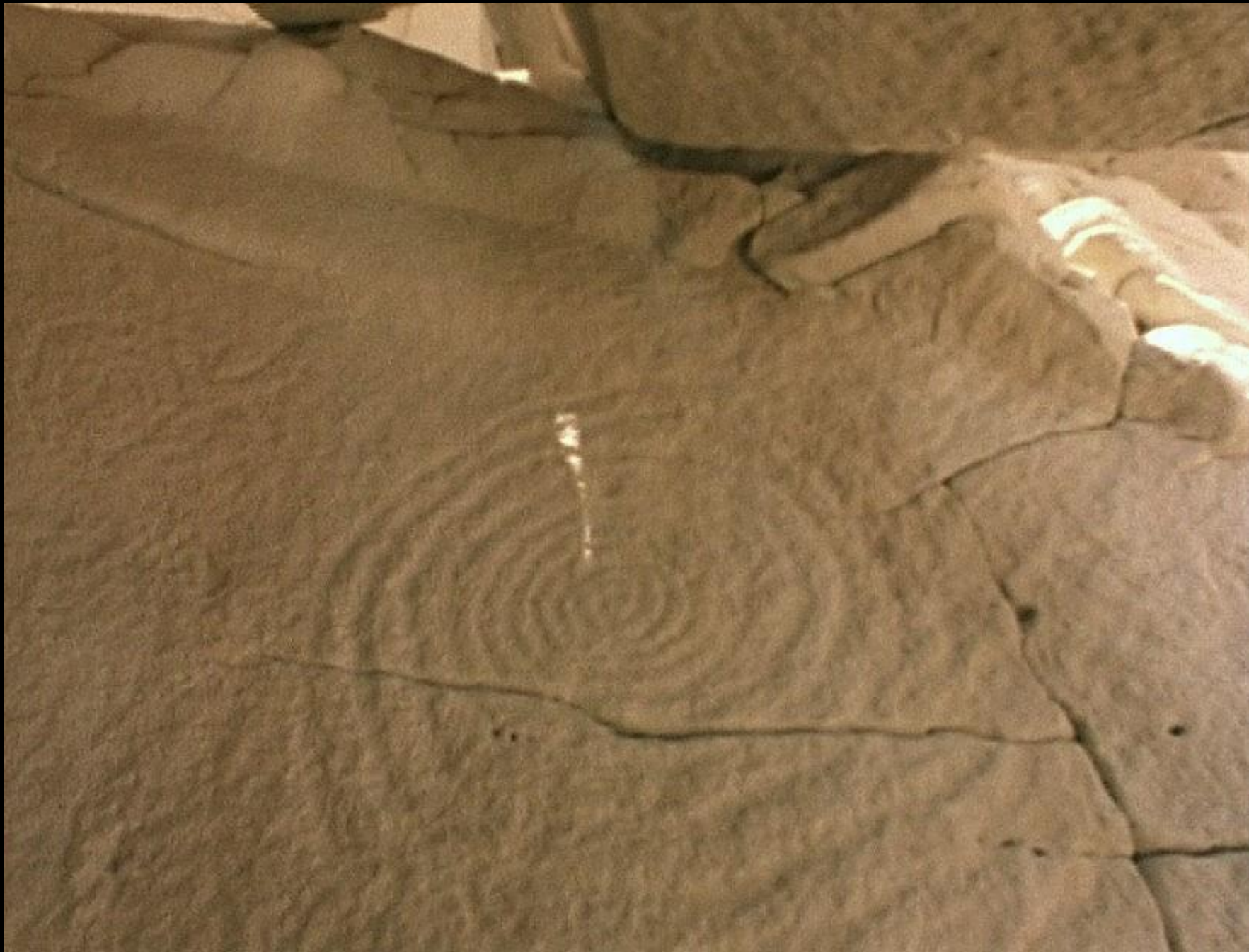


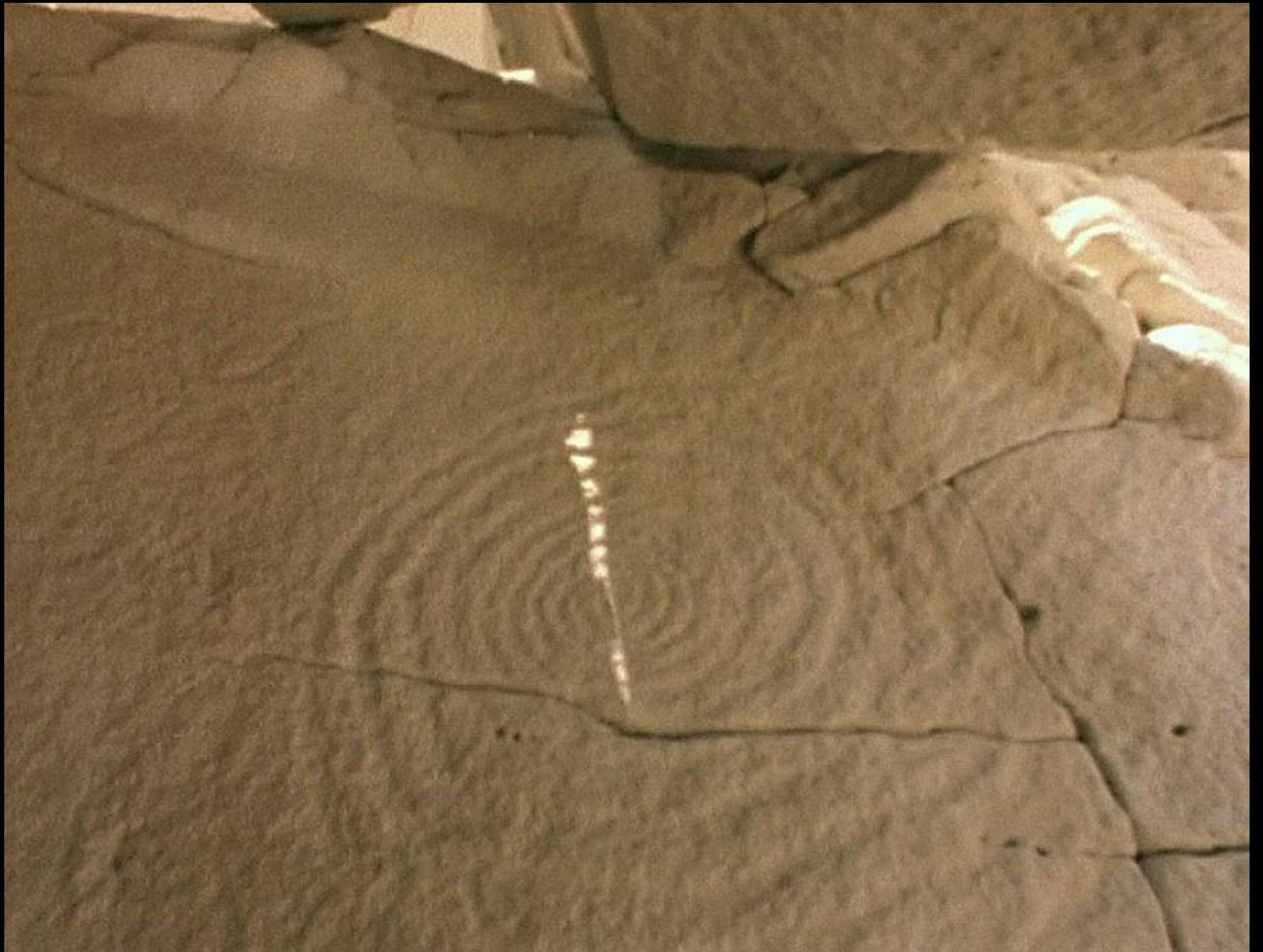


Fajada Butte
Sun Dagger

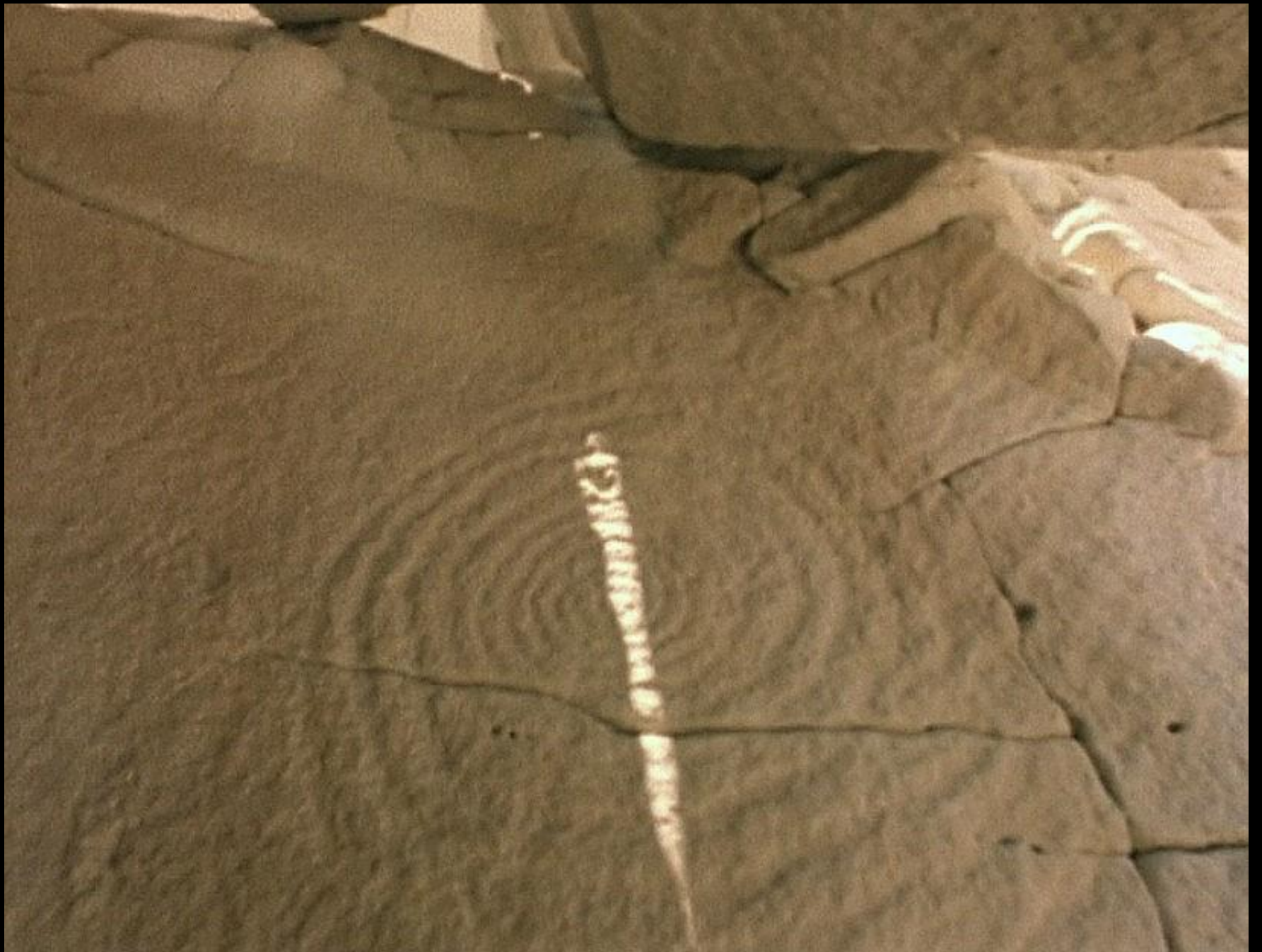




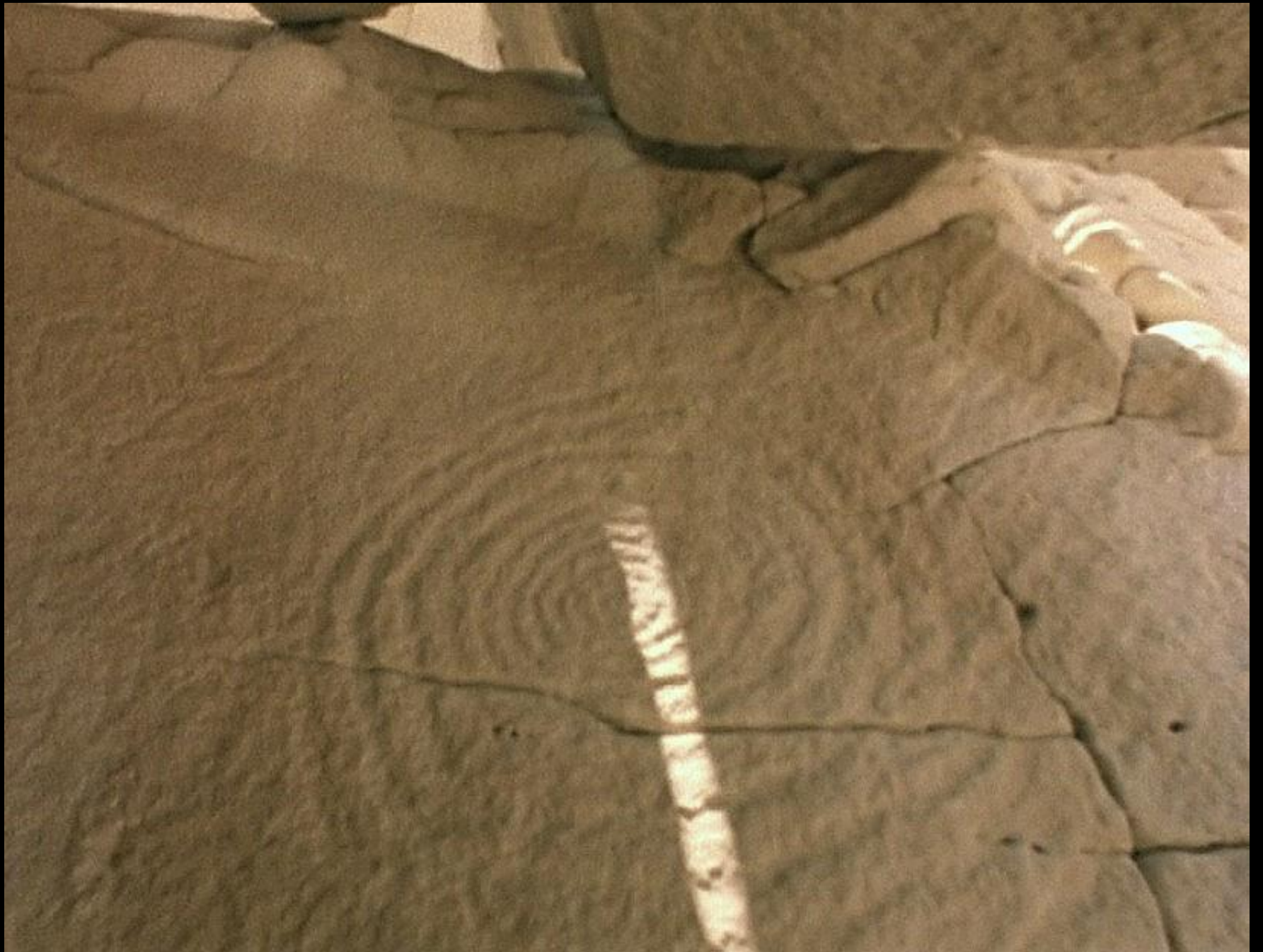


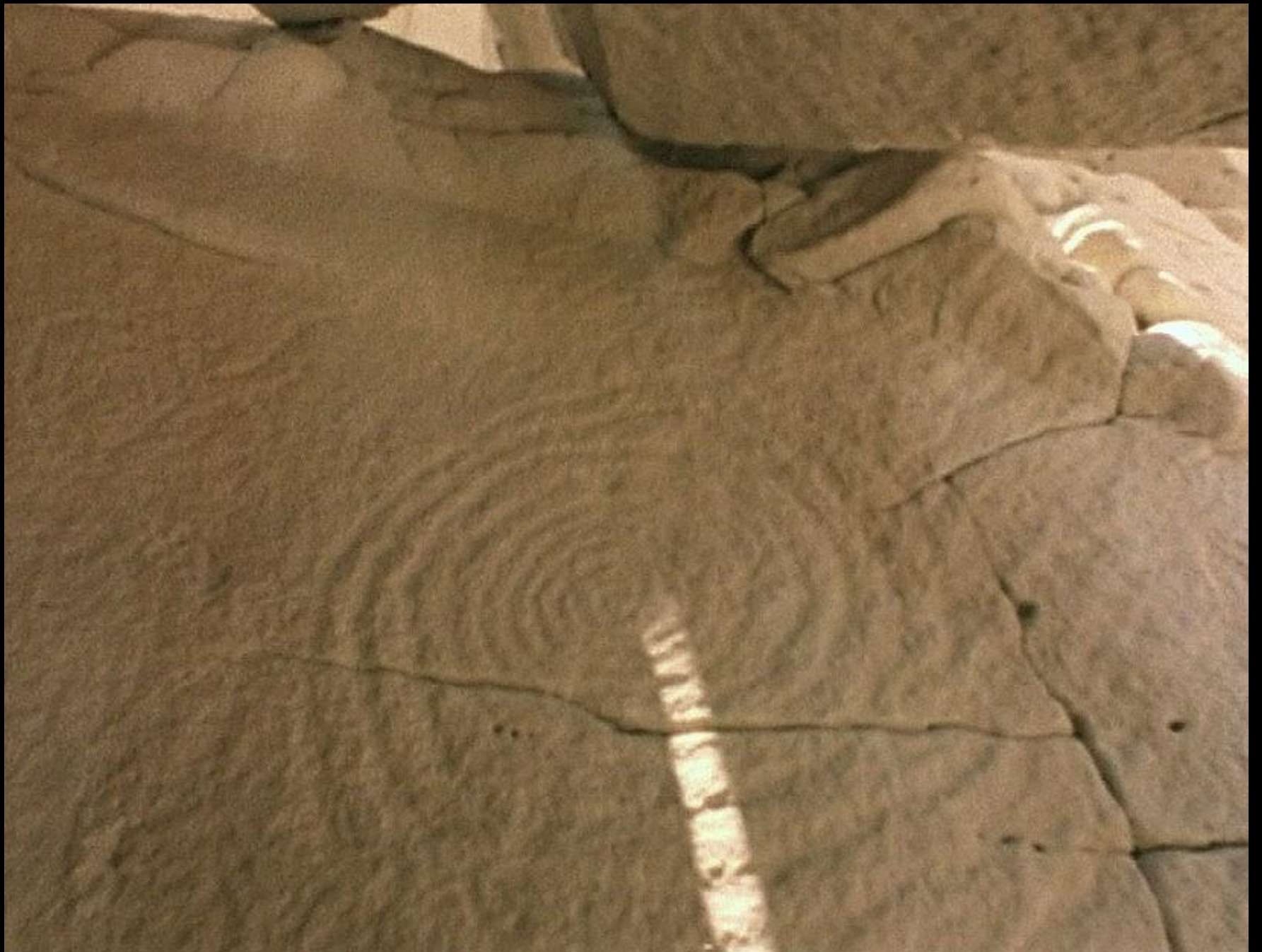


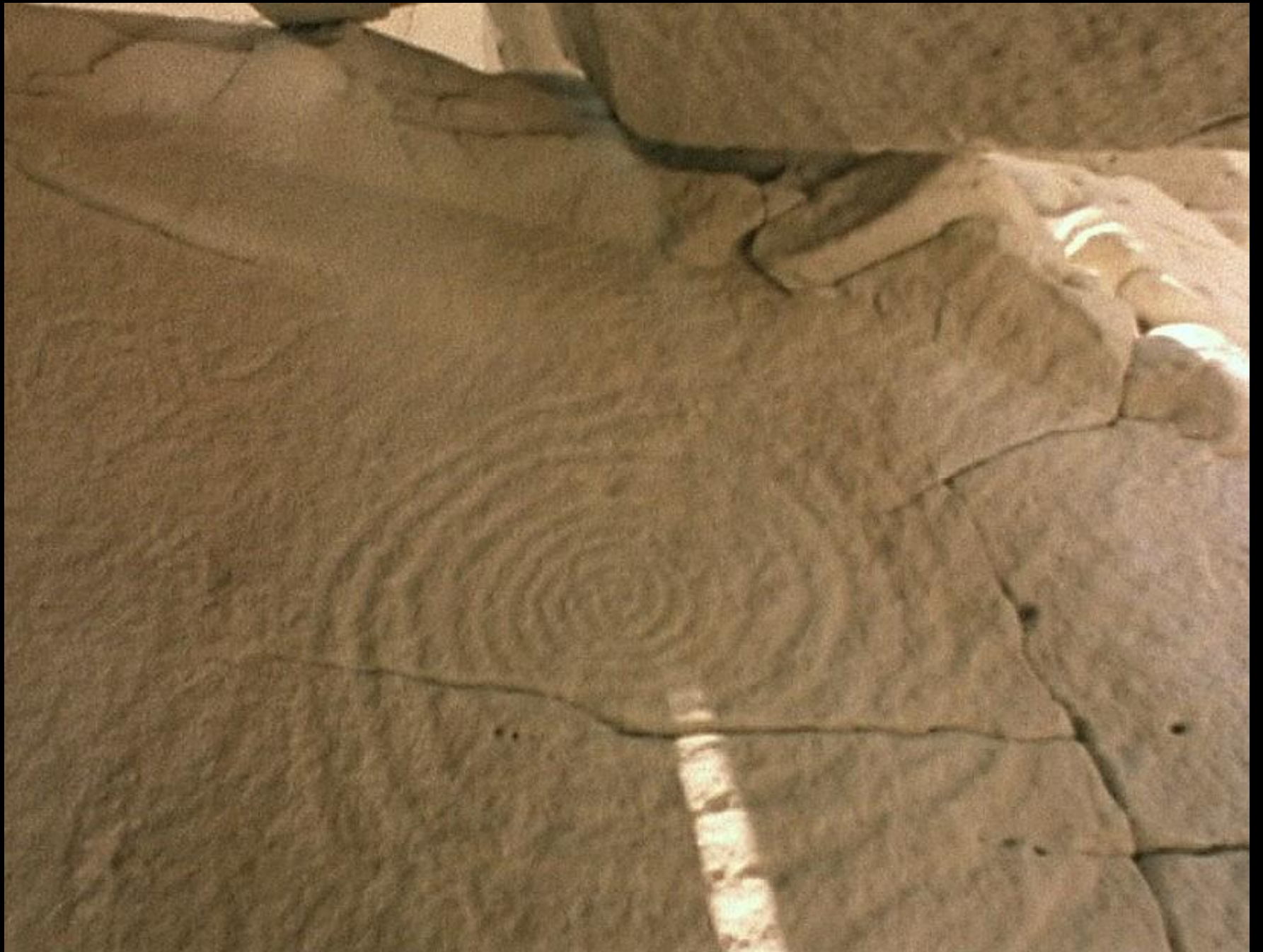






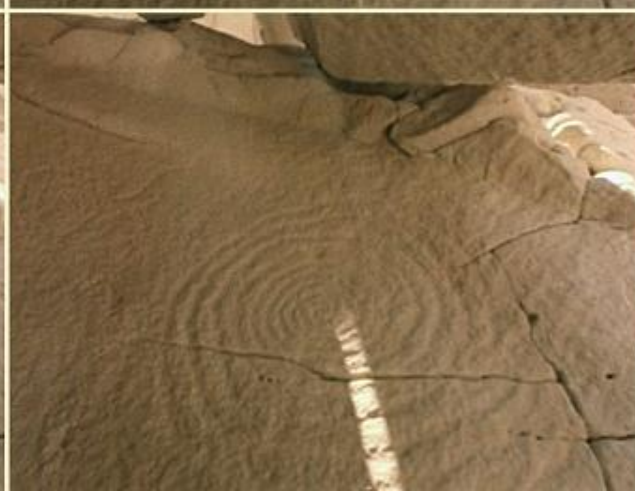
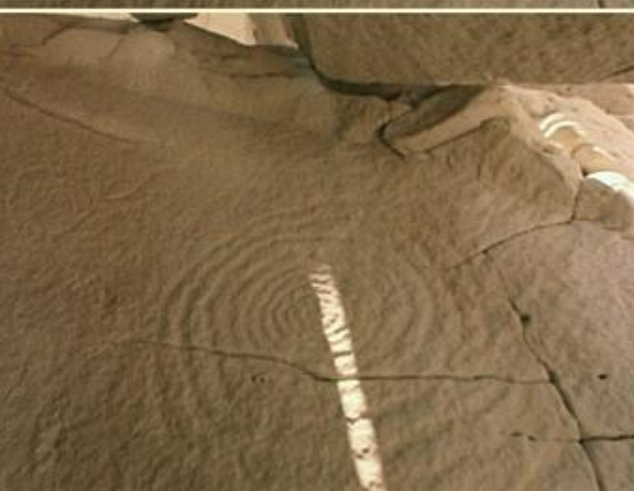
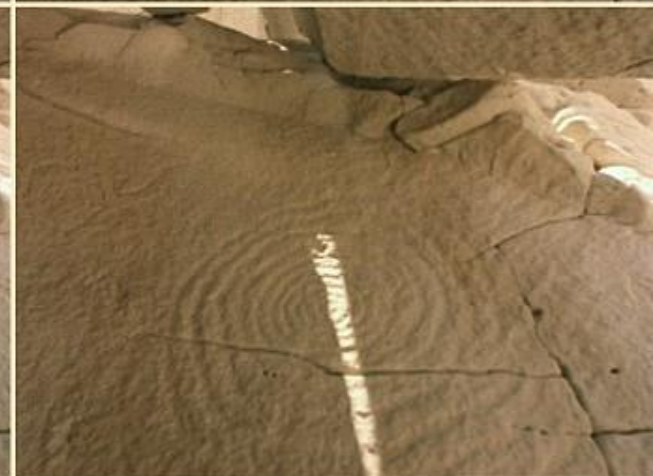
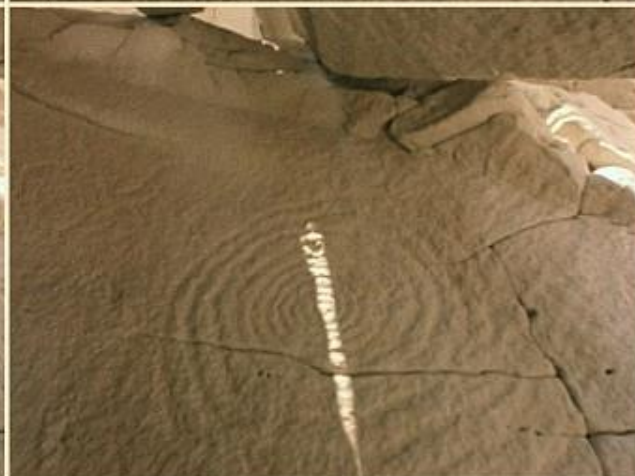
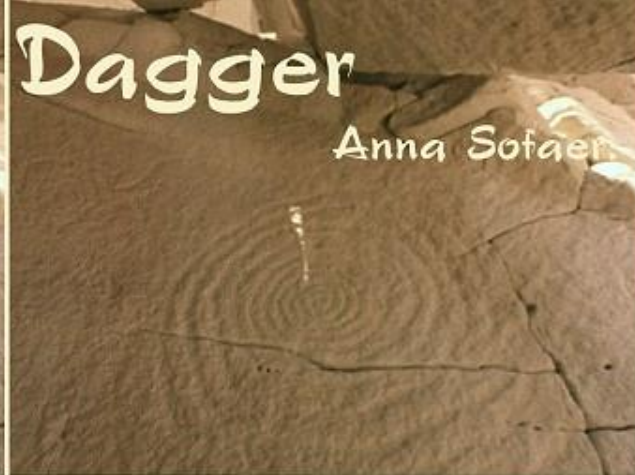






Fajada Sun Dagger

Anna Sofaer The Solstice Project





Complex Geometry

Sun at noon moves horizontally while the dagger move downward.

Sun Dagger



***Solstice Project
Computer Simulations***



day of winter solstice



day of winter solstice

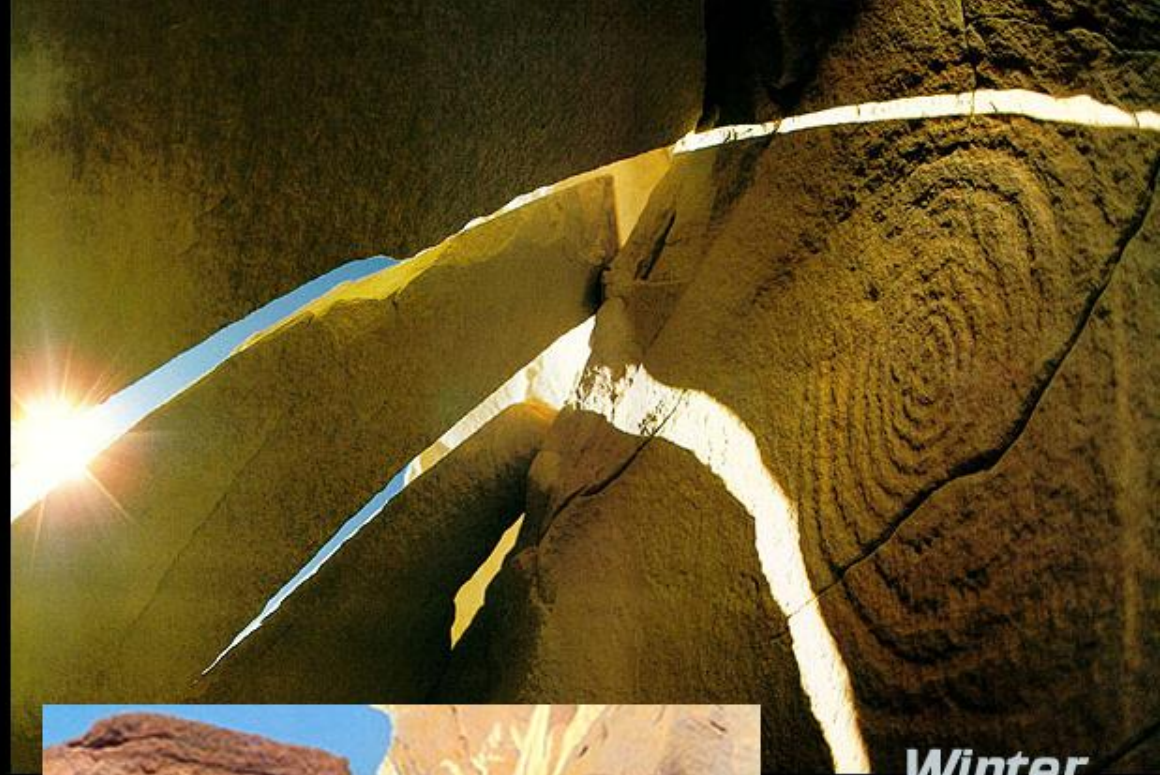
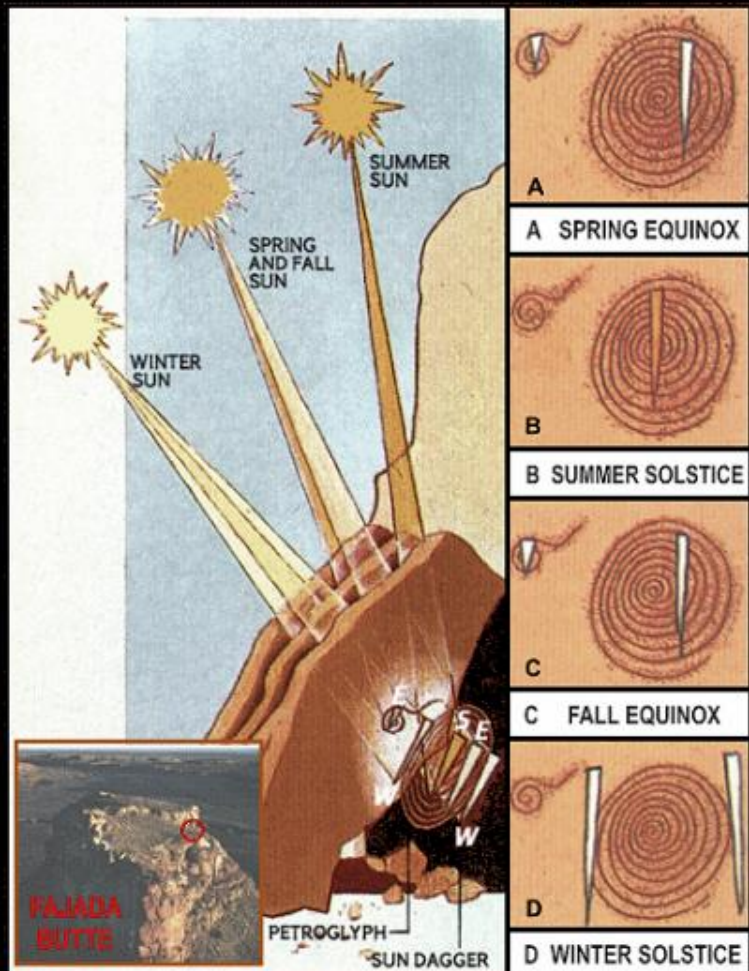
Sun Dagger

***Solstice Project
Computer Simulations***



day of spring equinox

Sun Dagger Geometry



*Winter
Solstice*



Equinox

New Mexico Museum of Natural History and Science

Albuquerque, NM





Sun Dagger Exhibit

Mini-Sun Dagger

29 SJ 532

Light from a natural crack in the rock shines down on the rock slab which is being photographed.



Time-lapse photography of the Mini Sun Dagger for a National Park Service video on Chaco



A seat was carved from the rock by a shaman so he could sit in the shade while watching the phenomenon take place



29 SJ 532

Spiral (water or sun)

20th century
graffiti

Ant like
creature

29 SJ 532

July 6, 2002

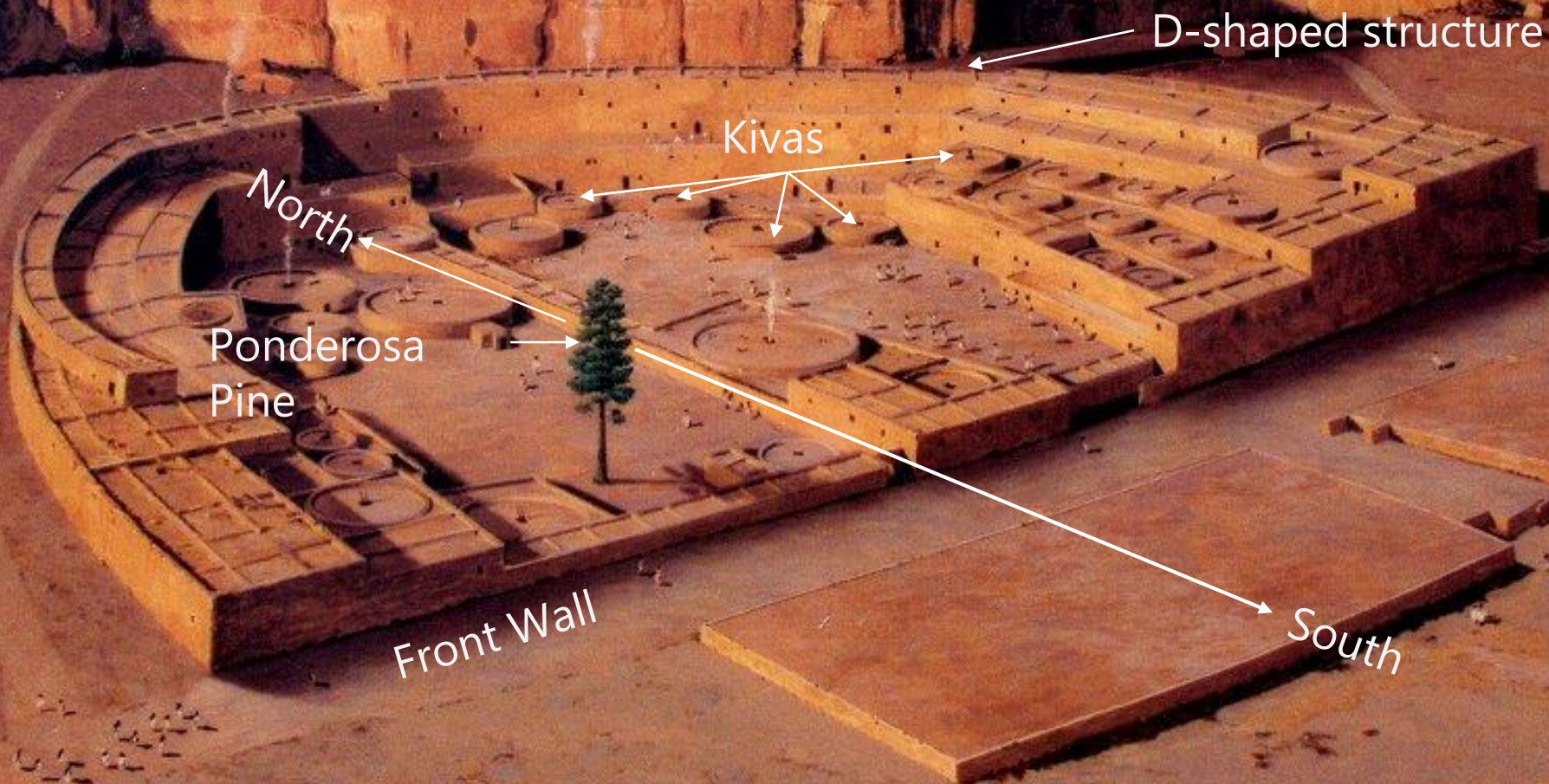
13:44-20

Note how the dagger of light is to the right of the spiral.



Pueblo Bonito at its Apex, 1130 AD

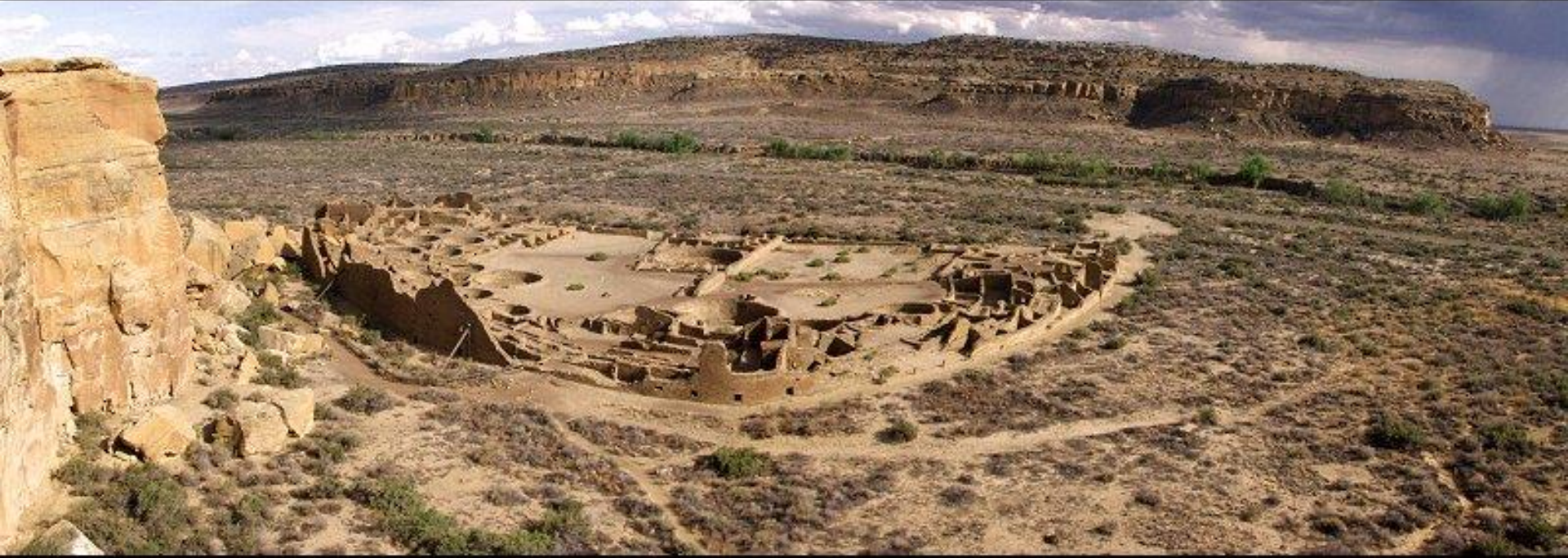
Identify the astronomy associated with Bonito.





Pueblo Bonito, circa 1900

Pueblo Bonito from North Mesa



Sunrise
Altar

Sun Room



Sun Altar, SE Corner of Pueblo Bonito



Sun Altar, Early Morning, Summer Solstice



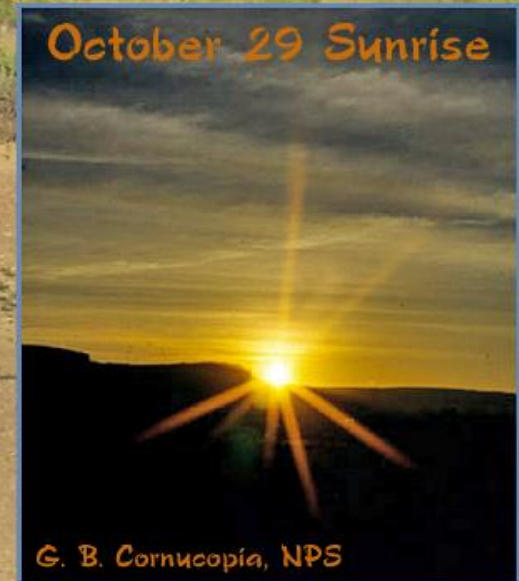
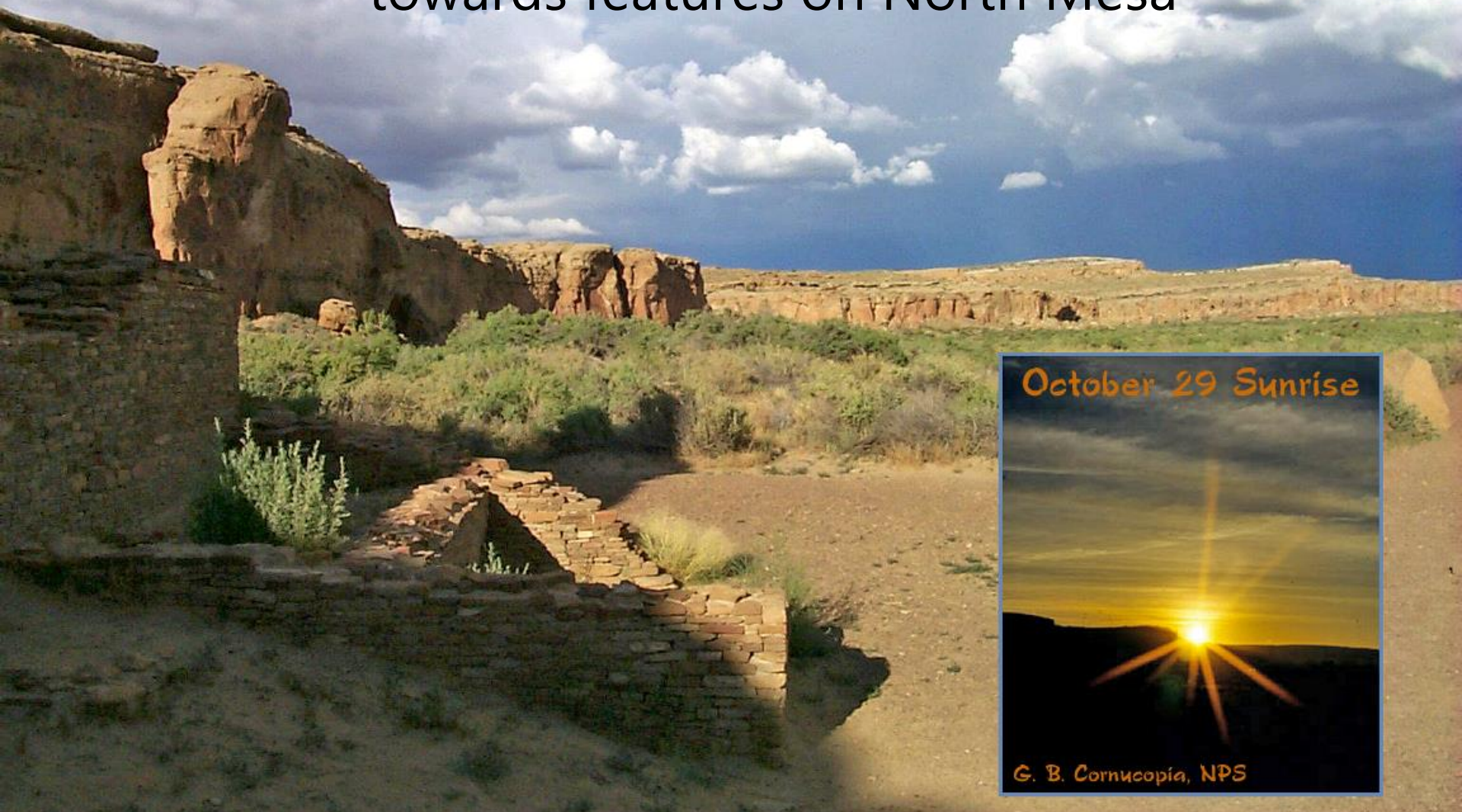
Pueblo Bonito, SE corner



Sunrise Altar

Sun Room

Pueblo Bonito, SE Corner Altar looking
towards features on North Mesa



Horizon becomes bland after
the Oct. 29 sunrise

Sunrise, October 29

Sunrise, October 30

Let' us go
inside...

G. B. Cornucopia, NPS

Pueblo Bonito Sun Room

July 4, 2001



Waiting for Moonrise

Doorway, not a
window



Sun Room Pueblo Bonito

Full moon rising in winter solstice position of sun, July 4, 2001...

20:11

20:14

20:17

20:20



Oct. 30 Sunrise



© B Cornucopia, NPS

Winter Solstice Sunrise



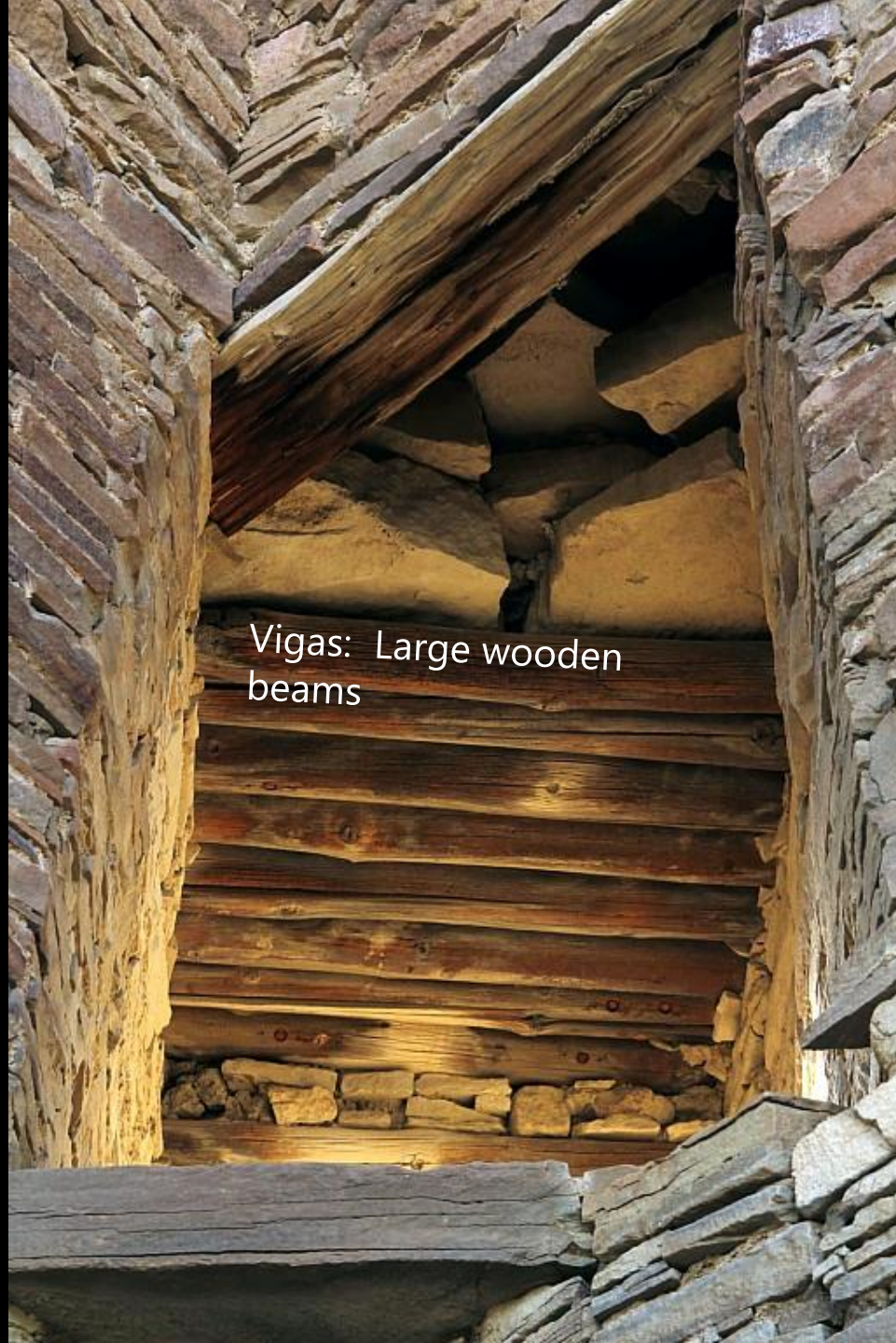
© B Cornucopia, NPS

Corner Doorway Looking into the Sun Room



Doorway to Pueblo Bonito's Sun Room

Archaeologists are positive that this corner doorway is not as old as the Sun Room. How is this fact known?



A corner window enhances or detracts from the structural integrity of the building?

Dendrochronology

the dating and study of annual rings in trees

1945 First Atomic Bomb

1861 Civil War

1846 New Mexico Acquired from Mexico



900 year old Redwood
Sequoia Sempervirens
Seven feet in height

Tree ring overlap extends
chronology back to
earlier dates.

Dendrochronology

developed by astronomer, A. E. Douglass 1867-1962,
Uni. of Arizona, during the first half of the 20th century

Summer
dark
— Spring—light

Cored tree sample



Tree to be dated is matched



• 980

• 1000

• 1020

• 1040

• 1060

MASTER CHRONOLOGY

against a master
chronology pattern.

Old Tree Ring Cores



Pueblo Bonito Looking Southeast. Construction ended in 1130 AD.



Tapered Wall

Core-and-Veneer Masonry





Type II—1000
AD

Core-and-Veneer Masonry

Rooms can be dated by the type of masonry used to construct them.

Walls were plastered and painted on their exterior.

Type III—1050 AD



**Early 20th Century Navajo Evil Spirit Buster
in the N-S Wall-Pueblo Bonito**

North Wall of Pueblo Bonito



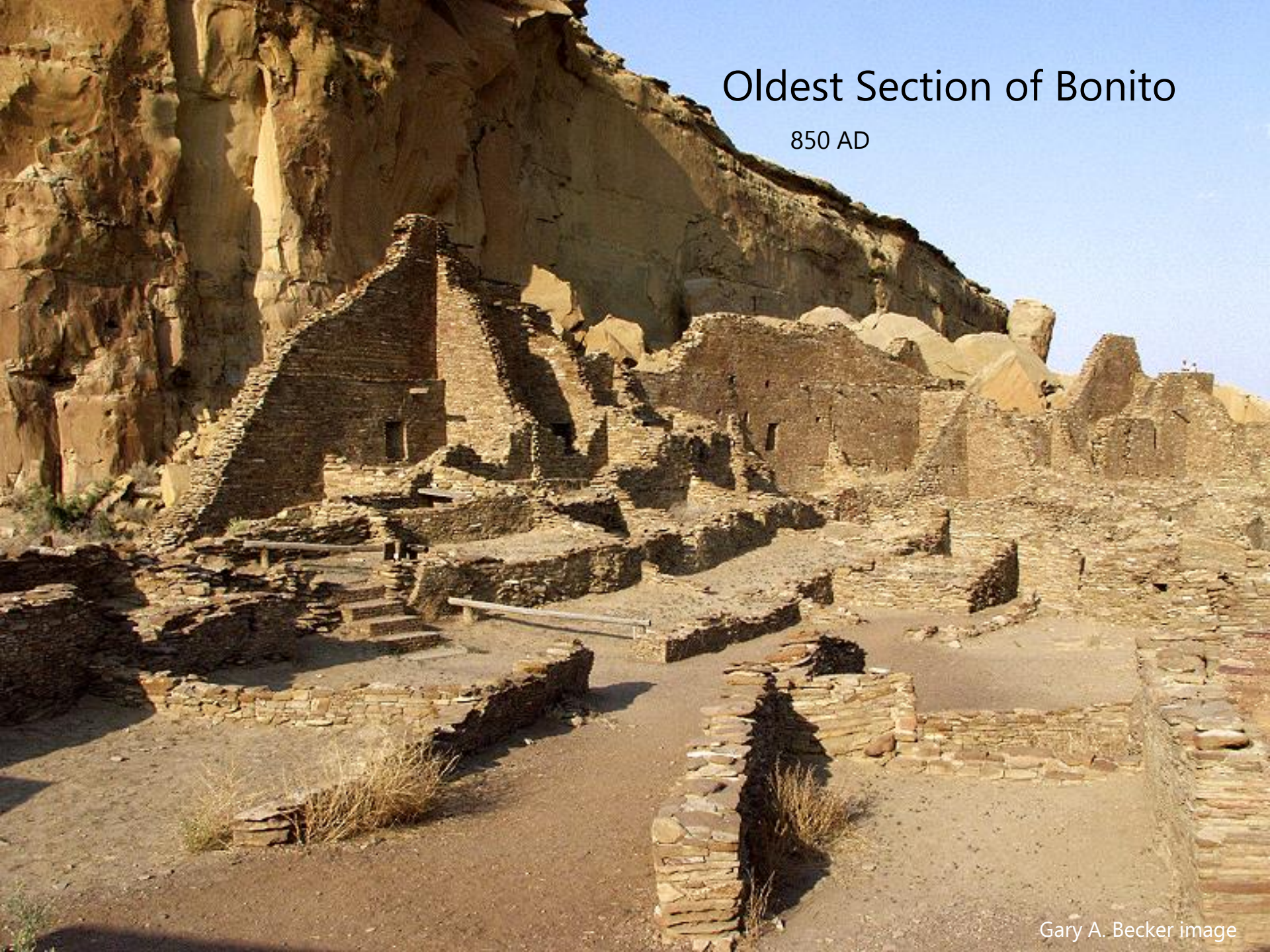
George H. Grant-1929



The wall was reinforced by the National Park Service in the 20th Century.

Oldest Section of Bonito

850 AD



Room in Pueblo Bonito
with original plaster

Latillas

Vigas: Large wooden beams

Mud
plaster

East-West Bonito Wall





T-Shaped Doorways





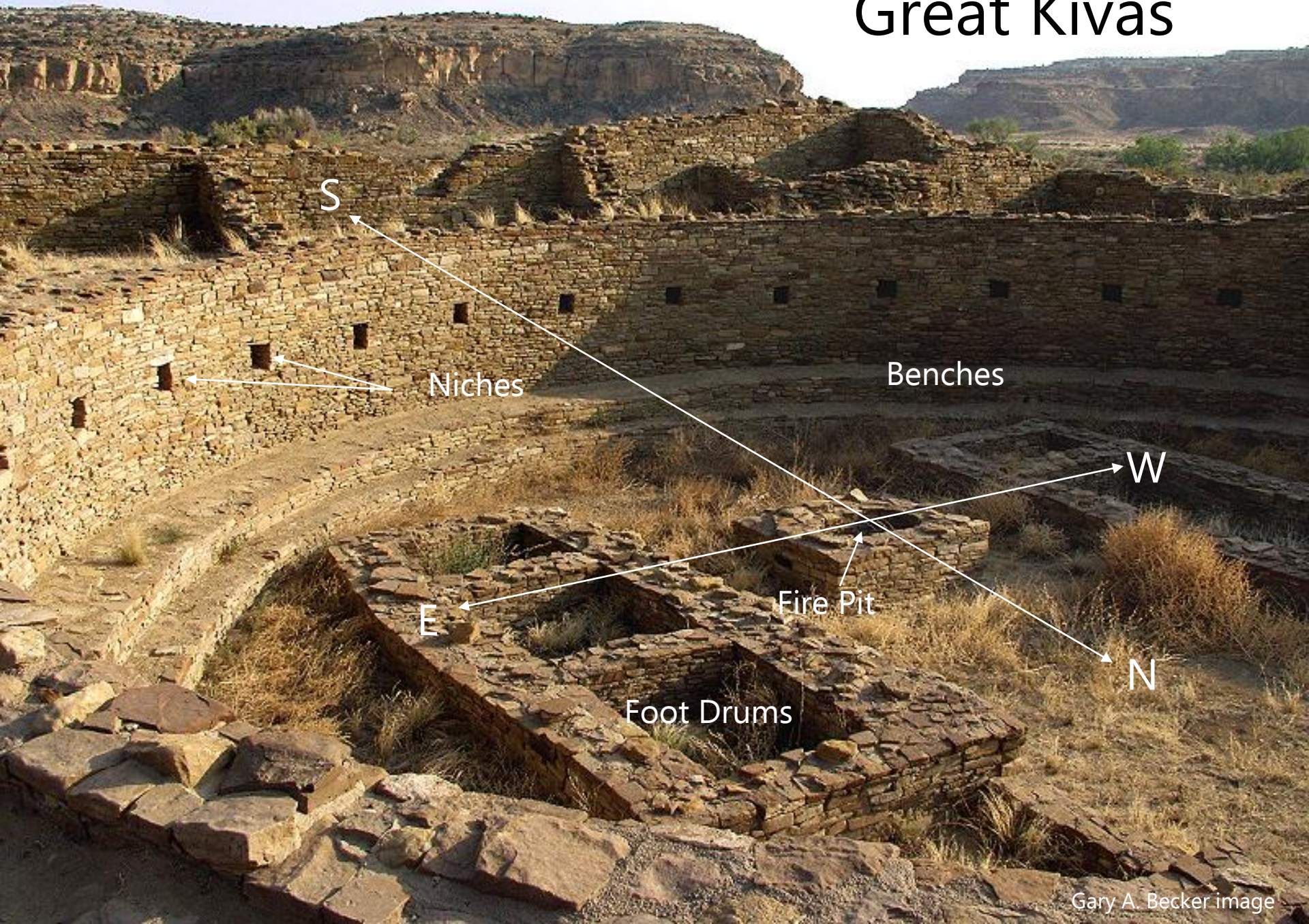
Pueblo Bonito Great Kivas





Polaris

Great Kivas



S

Niches

Benches

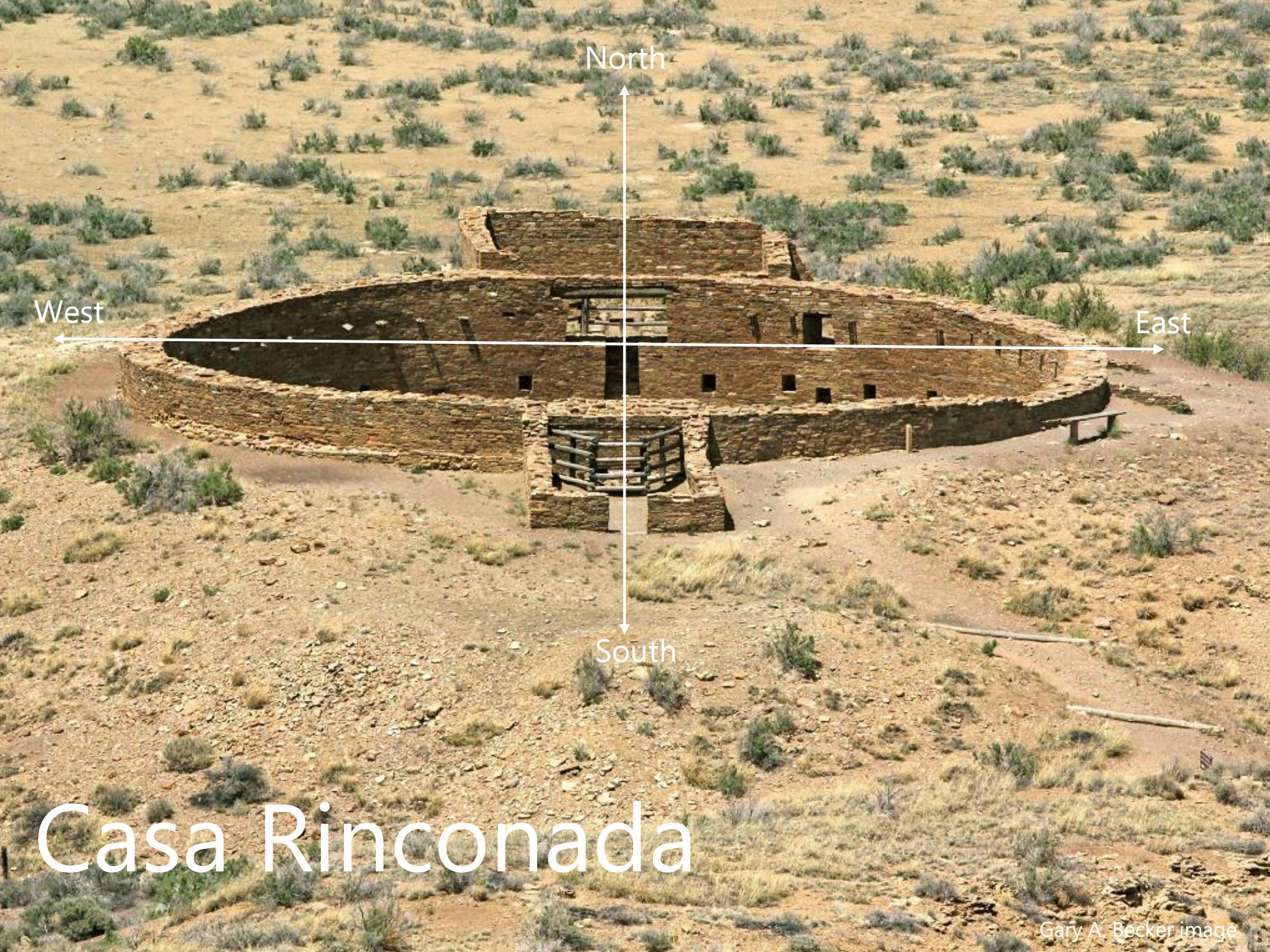
W

Fire Pit

E

Foot Drums

N



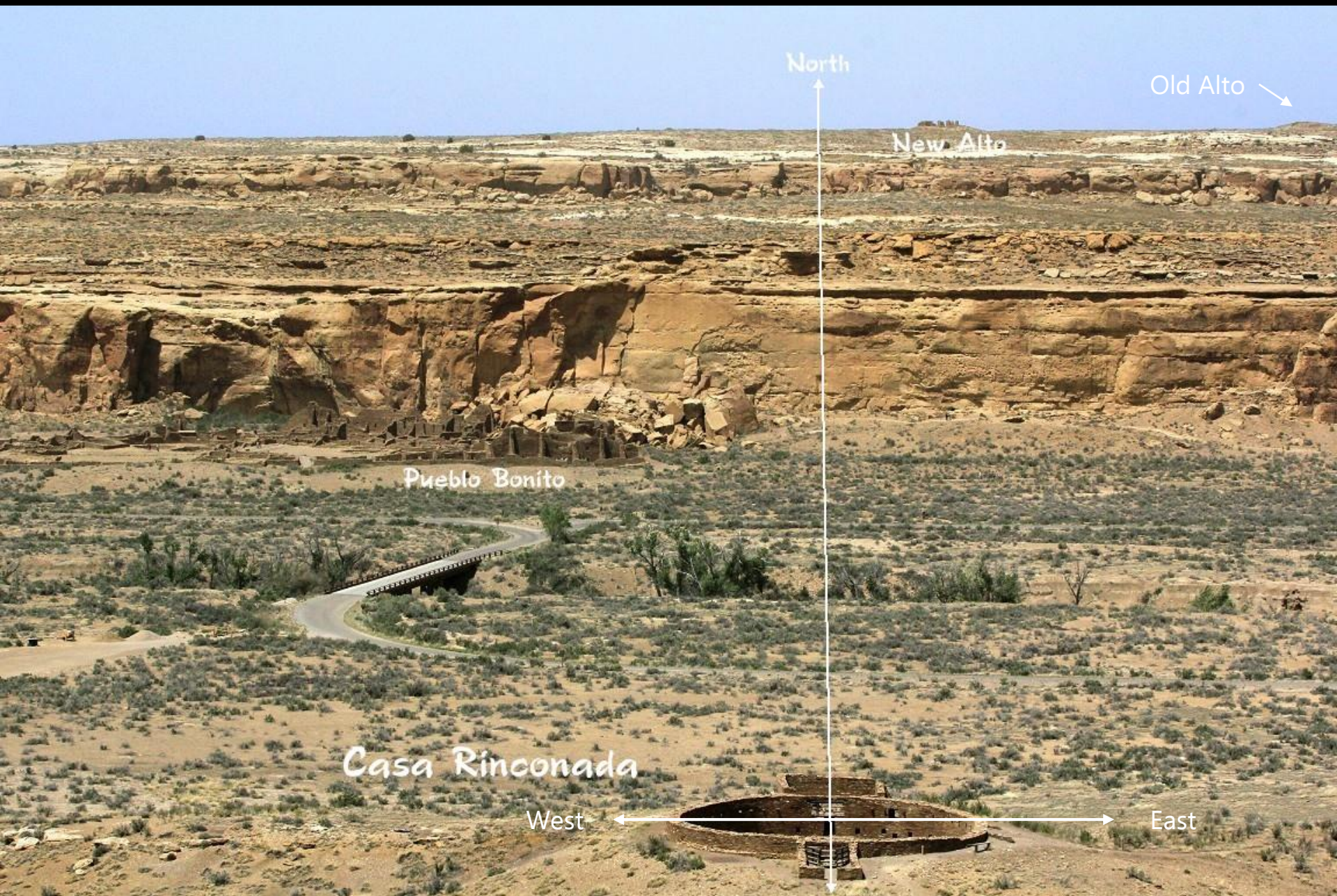
North

West

East

South

Casa Rinconada



Great Kiva, Aztec Ruins National Monument

Similar in many respects to Casa Rinconada









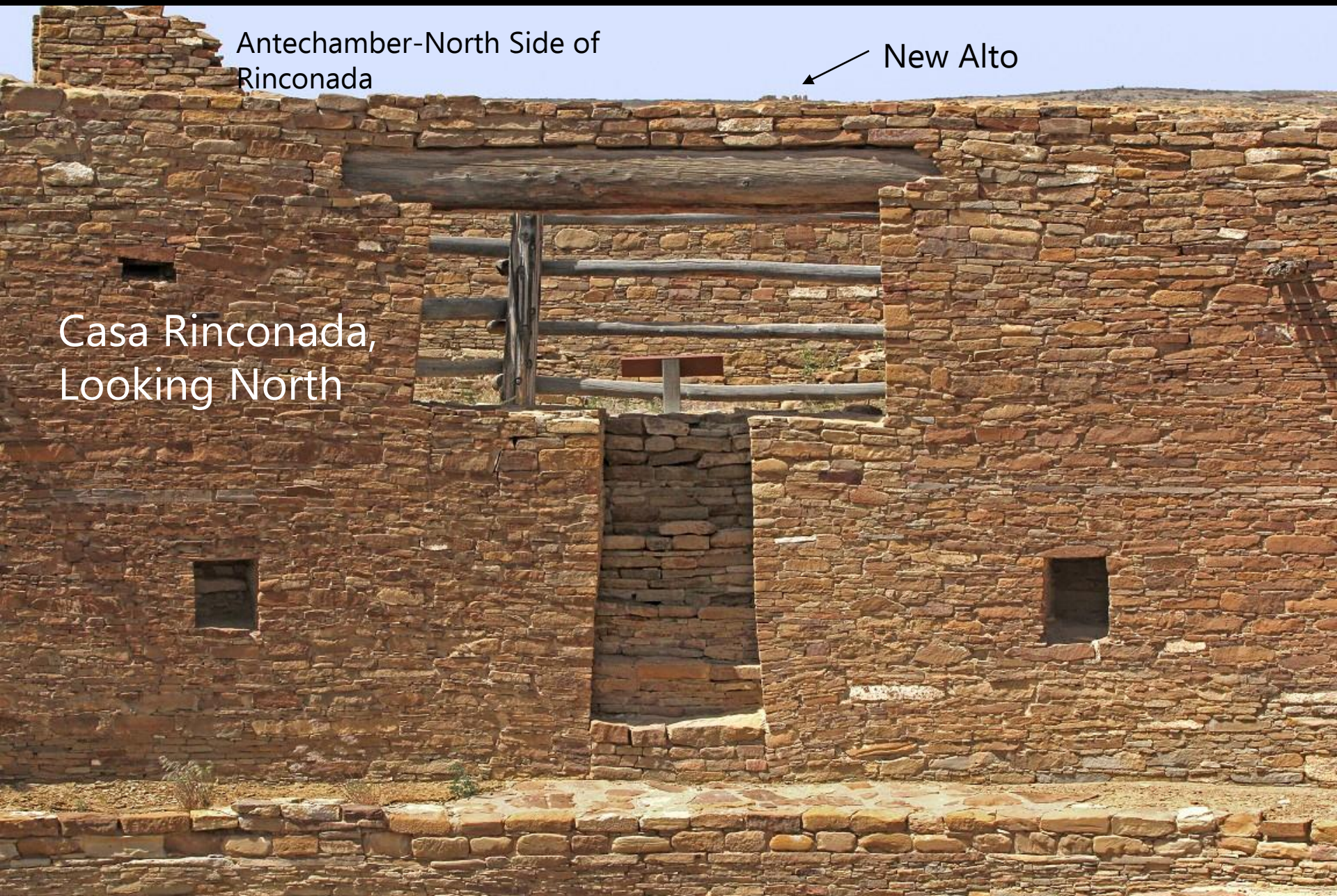
T-shaped doorways

Casa Rinconada,
Looking South

Antechamber-North Side of Rinconada

New Alto

Casa Rinconada,
Looking North



Casa Rinconada at Night

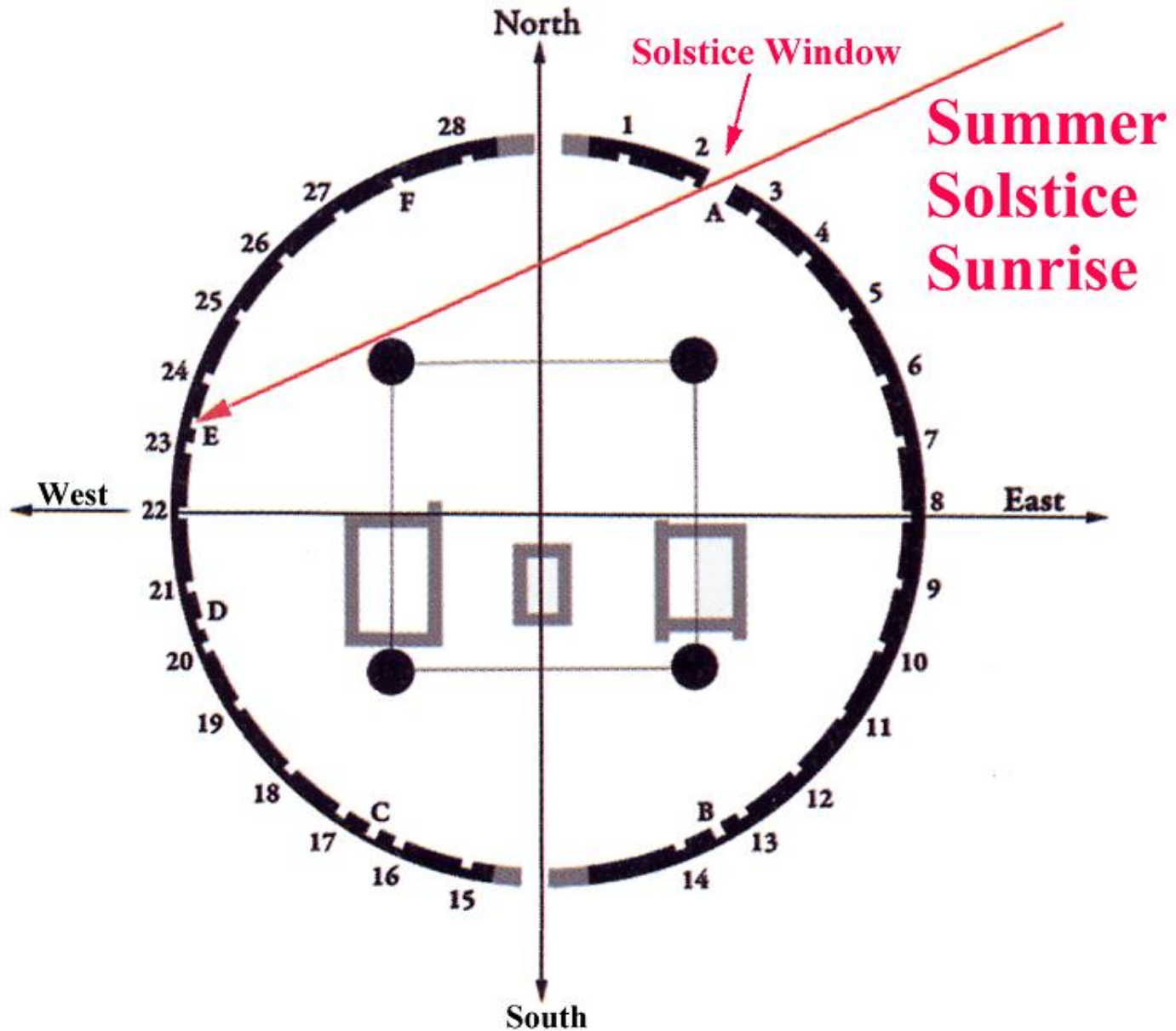
What astronomical alignment
Is seen in this photograph?



Casa
Rinconada
Looking East
on the Vernal
Equinox



Casa Rinconada





Direction of Sunrise

Astronomical Window?

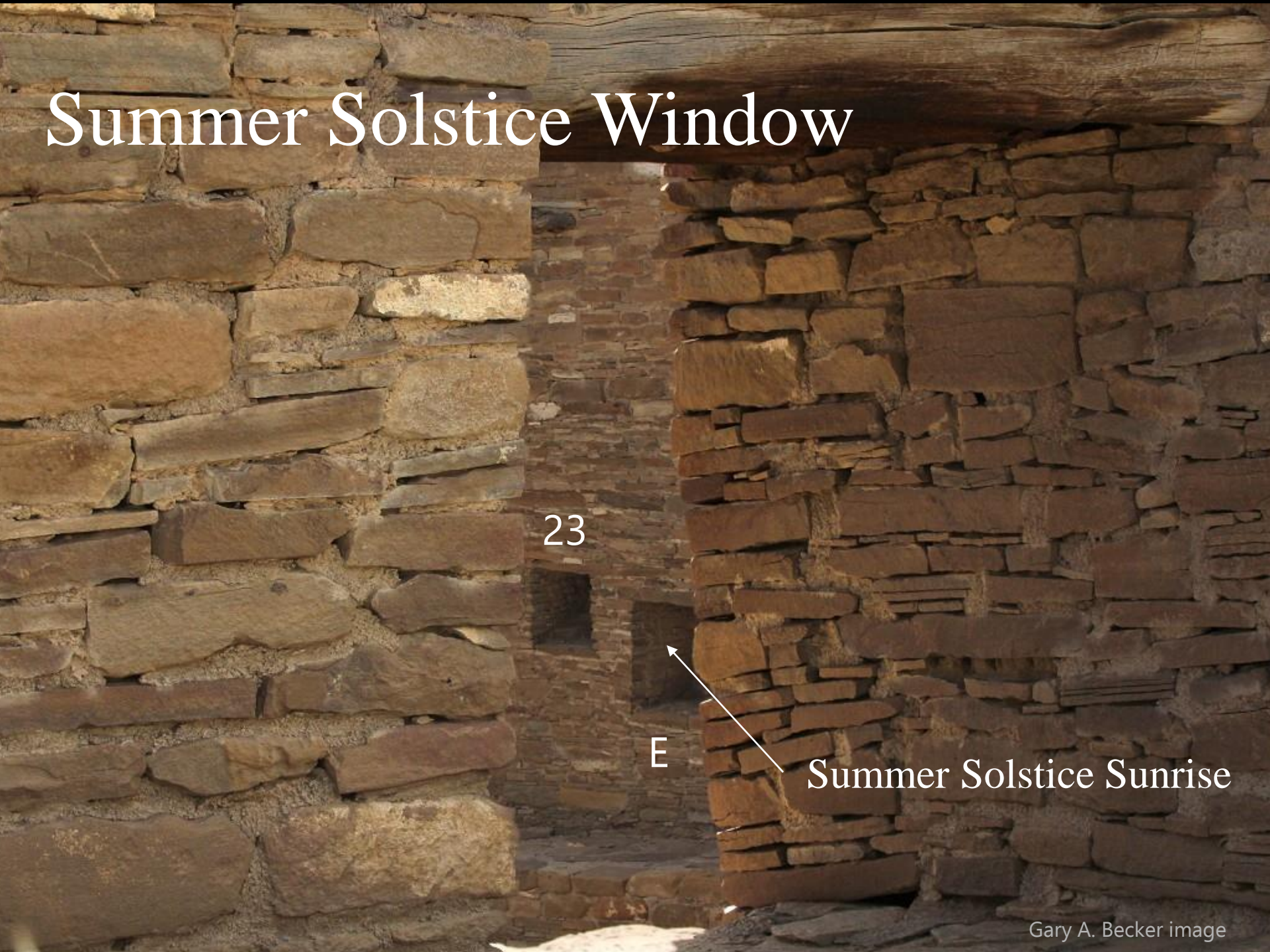
Casa Rinconada

Summer Solstice Window

23

E

Summer Solstice Sunrise





Waiting for the Sunrise...

Sunrise, Summer Solstice, 2001









reconstruction

Casa Rinconada: Pre and Post Reconstruction



Did the reconstruction of Rinconada in the early 1930's create the solstitial phenomenon, or was it there in the casa's original construction?

Hike to Penasco Blanco



A photograph of a dirt path winding through a Chaco wash. The path is light-colored and appears to be made of sand or gravel. On either side of the path are dense, green, scrubby bushes. The sky is filled with large, white, fluffy clouds, and the overall lighting suggests a bright, sunny day. The text "Across the Chaco Wash" is overlaid in the center of the image in a white, sans-serif font.

Across the Chaco Wash

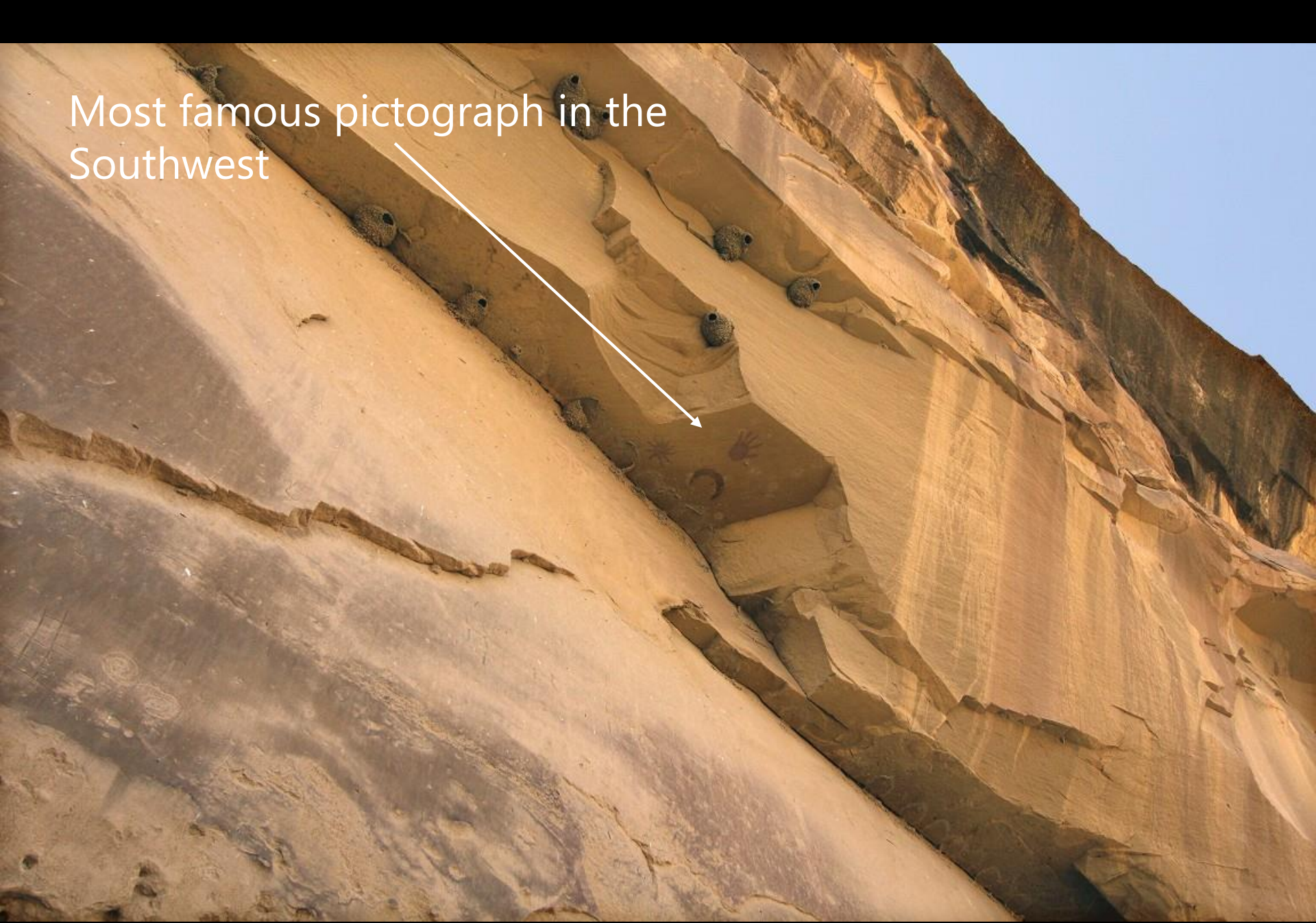


West Mesa

Most Famous Pictograph
in the Southwest

Most Famous Pictograph

Most famous pictograph in the Southwest



Facing Wall, looking west





Back against the wall,
looking up with front of
body pointing to the
eastern horizon



↓ Facing Wall, looking west



← Back against wall, looking east

1054 Supernova

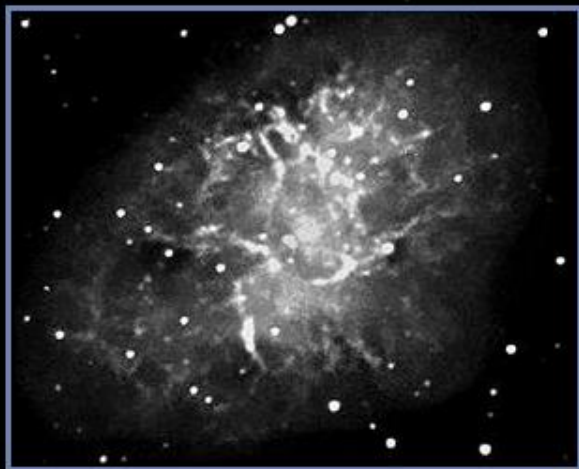
July 5, 3:00 a.m. MST

35 times brighter than Venus

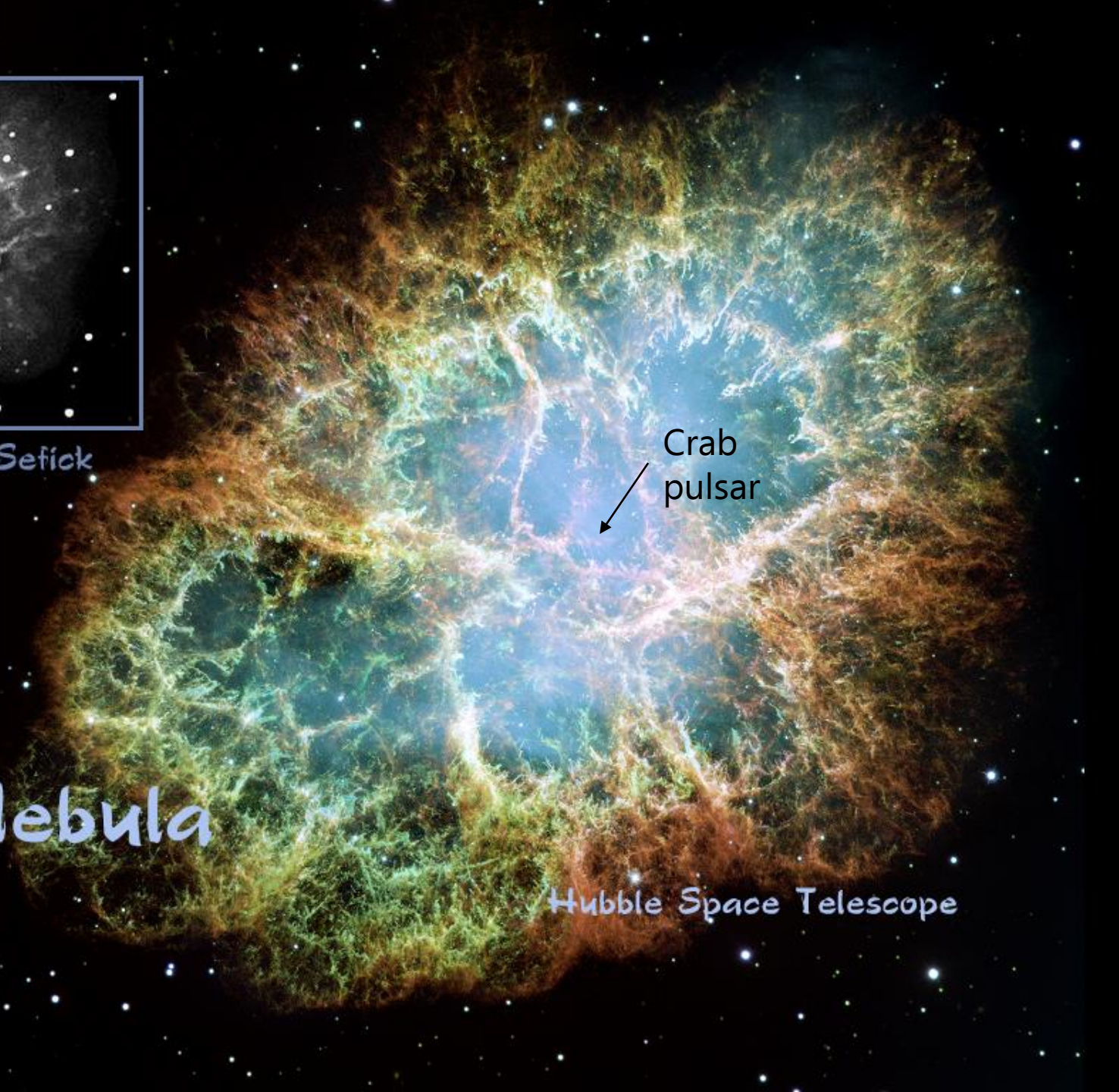
Visible during the daytime for eight consecutive days.

Recorded by the Chinese, Koreans, Japanese, and Puebloan People of the SW





from Chaco John Seftick



Crab
pulsar

Crab Nebula

Supernova
of 1054 AD

Hubble Space Telescope



Venus and Moon, Nov. 1, 2008, NYC- Rockefeller Center represents an alternative explanation for the the pictograph

but there is more...



Kin Kletso



Passageway
from Kin
Kletso to
North Mesa









A wide-angle photograph of a desert landscape. In the foreground, a circular arrangement of stacked, flat, light-colored rocks forms a stone circle. The ground is sandy and sparsely covered with small, scrubby plants. In the middle ground, a dirt path leads towards a small wooden post or marker. The background features a large, rocky hillside with distinct horizontal layers of sedimentary rock, under a clear, bright blue sky.

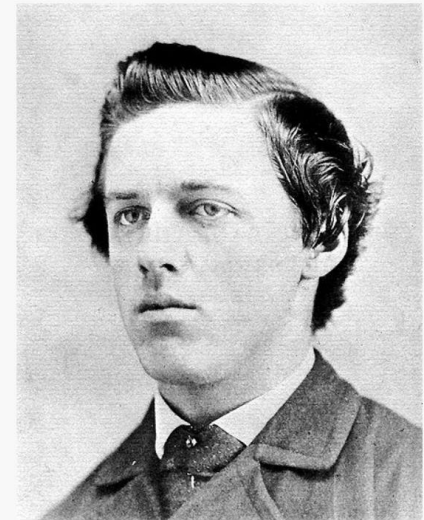
Stone Circle above Bonito



Jackson Stairway

Pueblo Alto Trail

William Henry Jackson



William Henry Jackson in 1862

Born	April 4, 1843 Keeseville, New York, US
Died	June 30, 1942 (aged 99) New York City, US

Near Penasco Blanco



Thousand Year Old Fingerprints





**Mano-Spanish for
"hand." Used for
grinding corn.**



Student Conservation Association

<https://www.thesca.org/npsa>



Brandon Velivis,
PA

Trang Do,
FL

Holli Blackwell,
VA

SCA': Student Conservation Association



Virga is rain that evaporates before it hits the ground-very common in the Southwest

Sunset double
rainbow





Chimney Rock

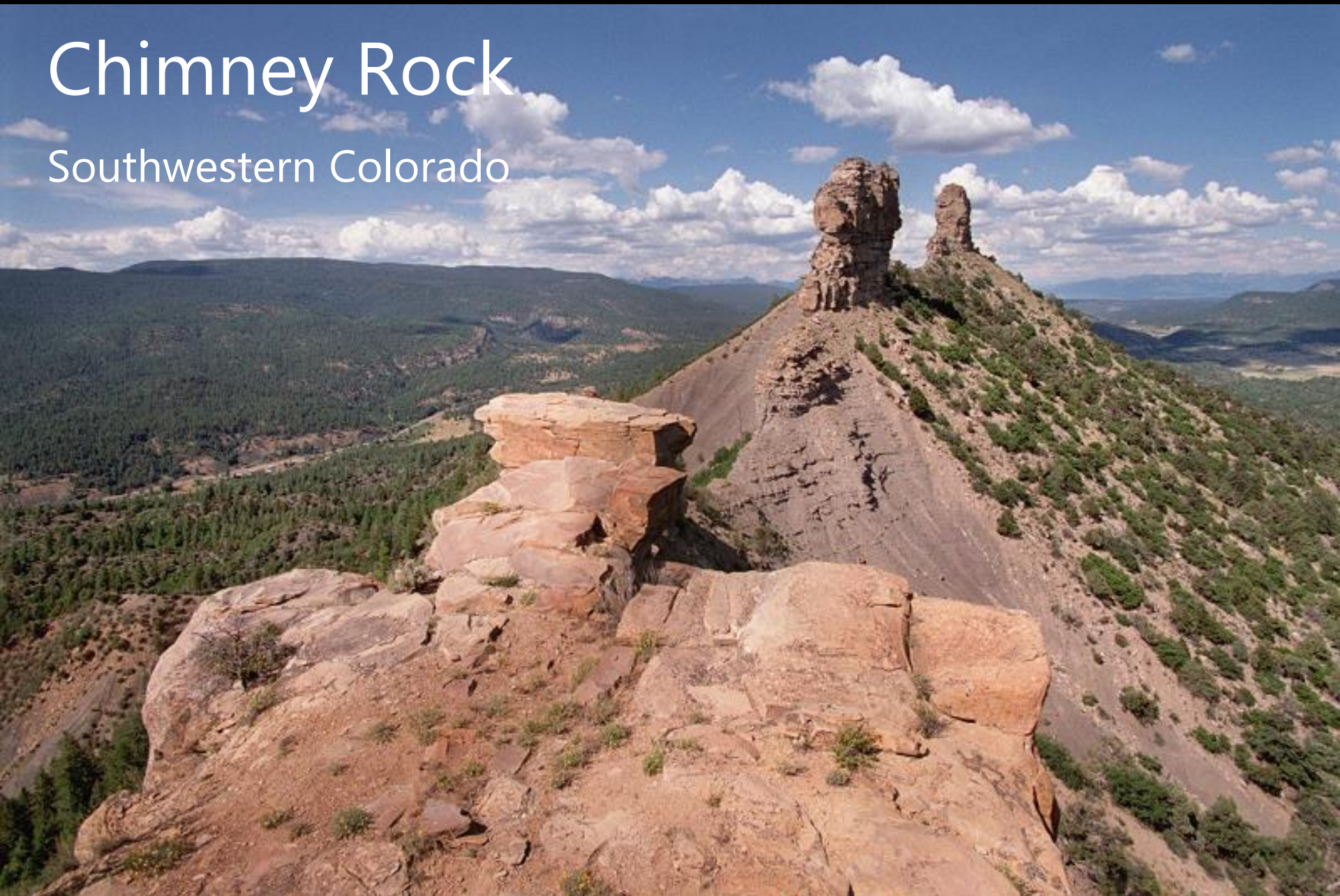
Chaco's Farthest

Outlier

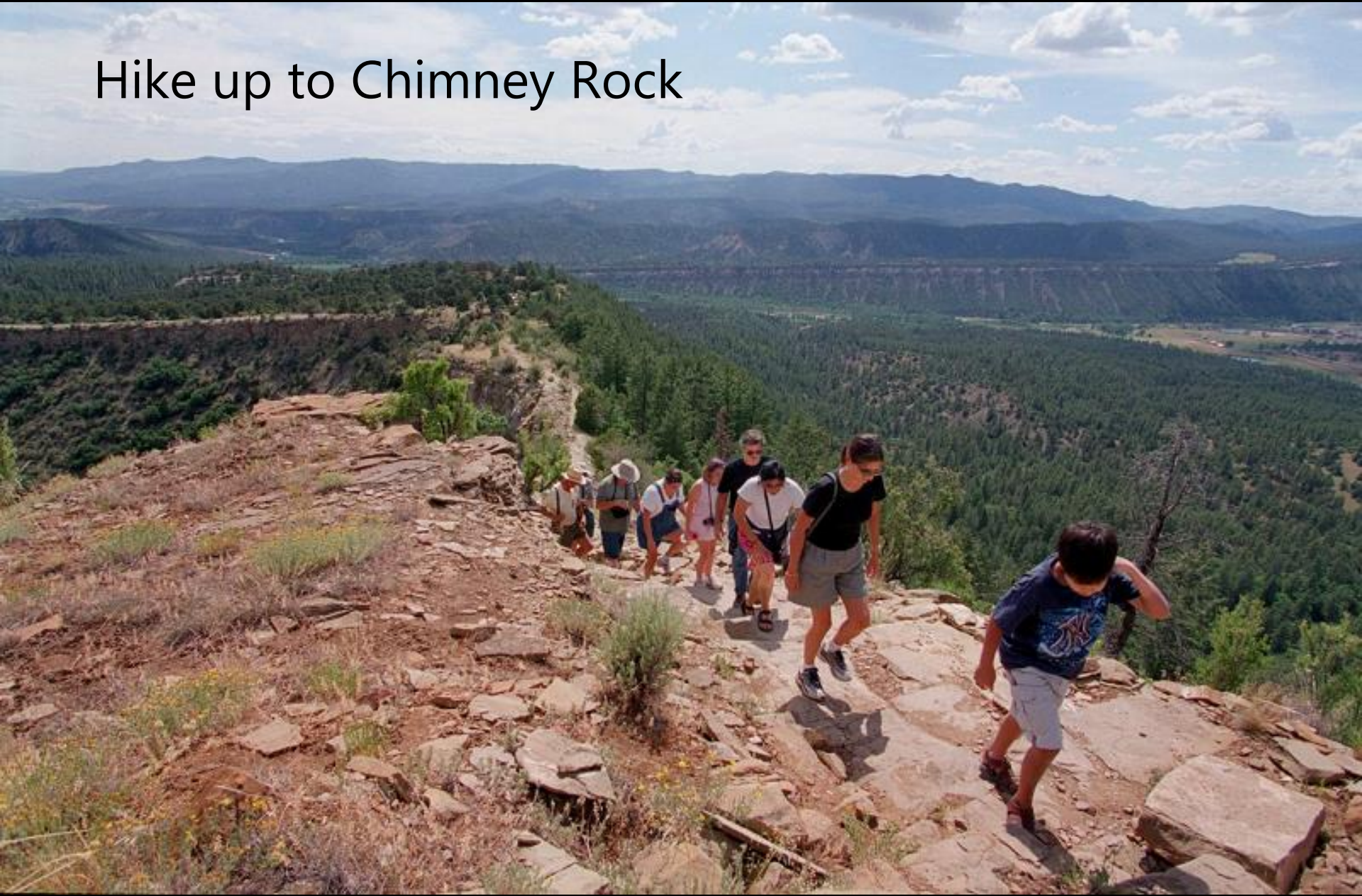
Pagosa Springs, Colorado

Chimney Rock

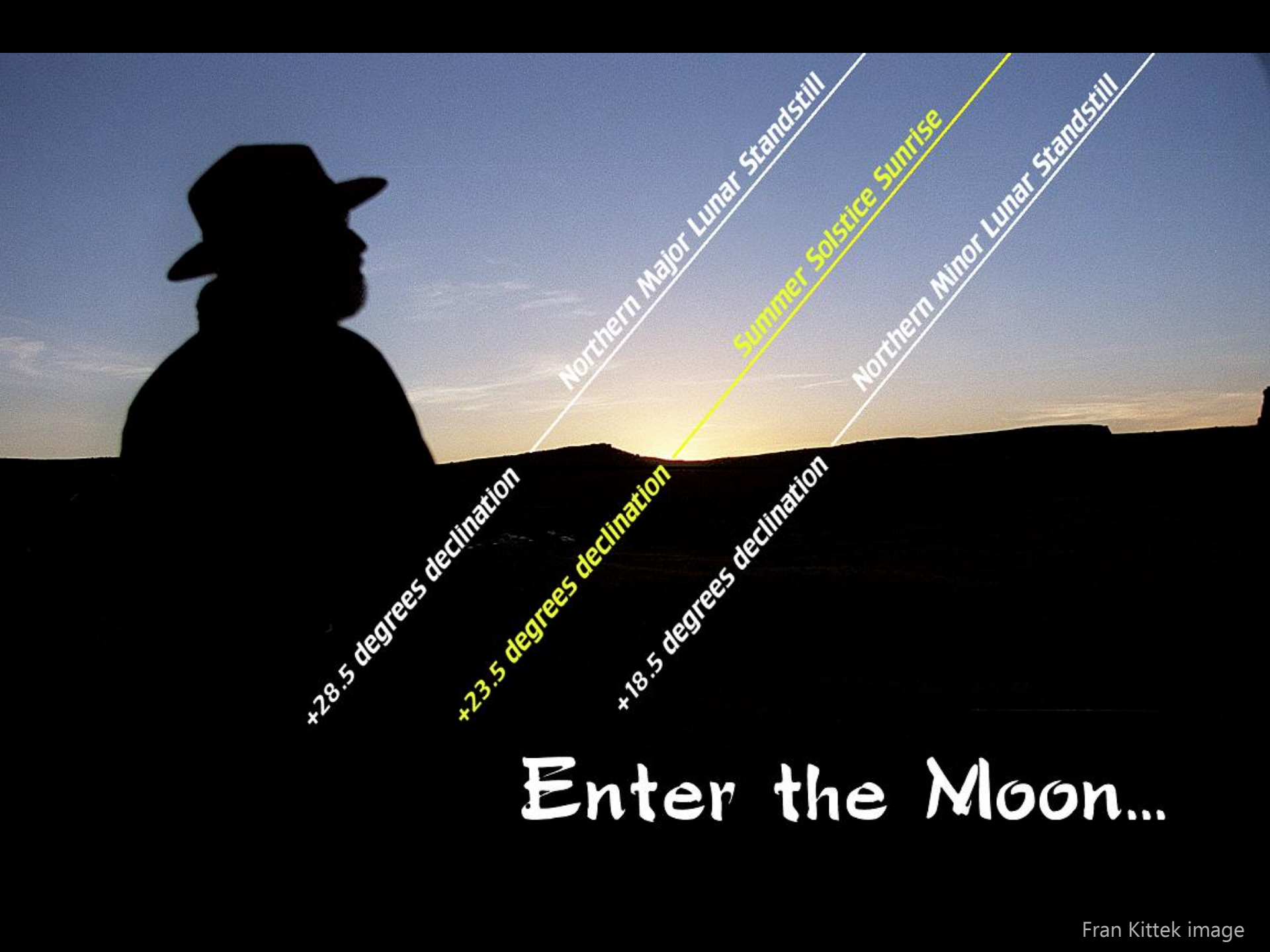
Southwestern Colorado



Hike up to Chimney Rock







Northern Major Lunar Standstill

Summer Solstice Sunrise

Northern Minor Lunar Standstill

+28.5 degrees declination

+23.5 degrees declination

+18.5 degrees declination

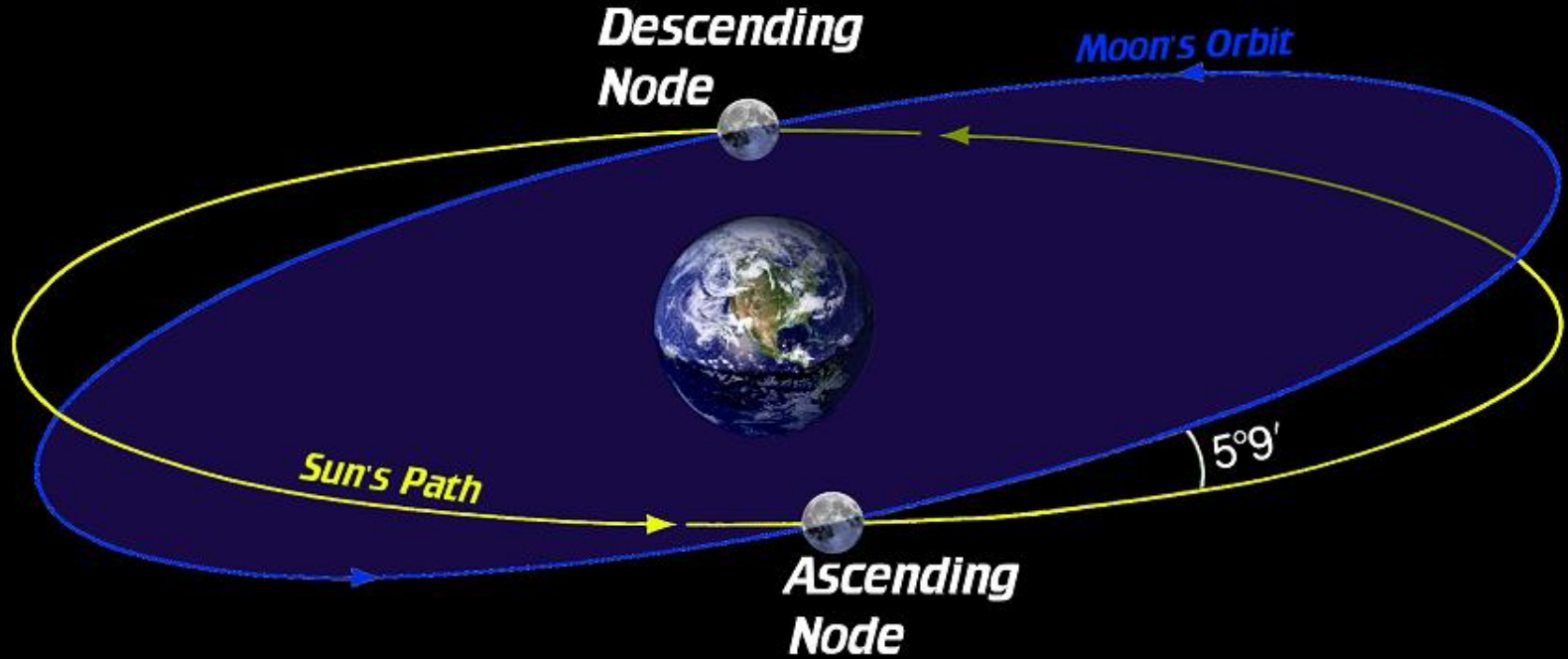
Enter the Moon...

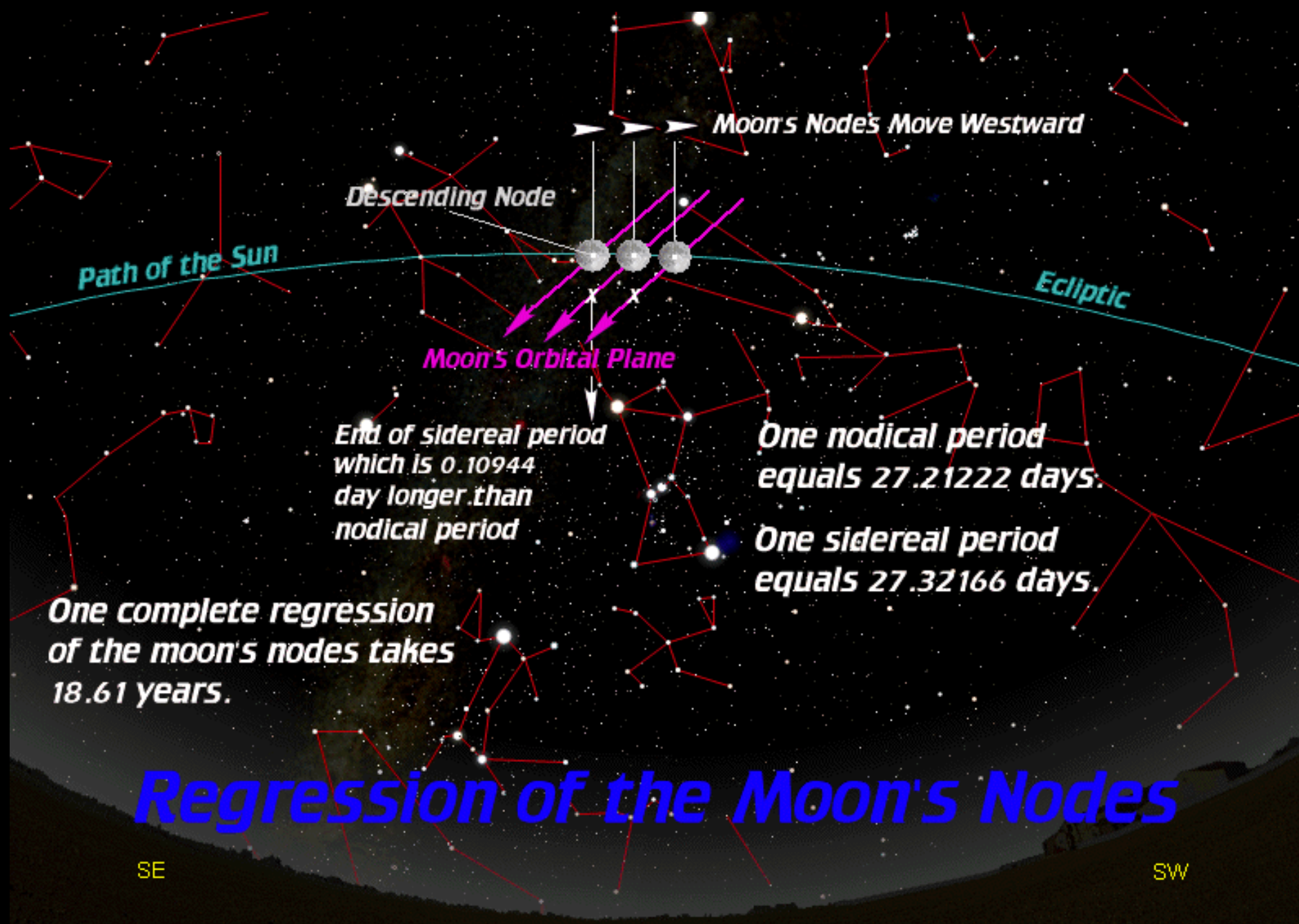
A photograph of Chimney Rock, a prominent sandstone formation with two tall, thin spires. The sun is visible between the spires, creating a silhouette effect. The sky is a pale blue, and the surrounding landscape is a mix of rocky terrain and sparse vegetation. In the distance, snow-capped mountains are visible under a clear sky.

Chimney Rock Major Standstill Moonrise

(+28-1/2 degrees)

Inclination of the Moon's Orbit





Moon's Nodes Move Westward

Descending Node

Path of the Sun

Ecliptic

Moon's Orbital Plane

*End of sidereal period
which is 0.10944
day longer than
nodical period*

*One nodical period
equals 27.21222 days.*

*One sidereal period
equals 27.32166 days.*

*One complete regression
of the moon's nodes takes
18.61 years.*

Regression of the Moon's Nodes

SE

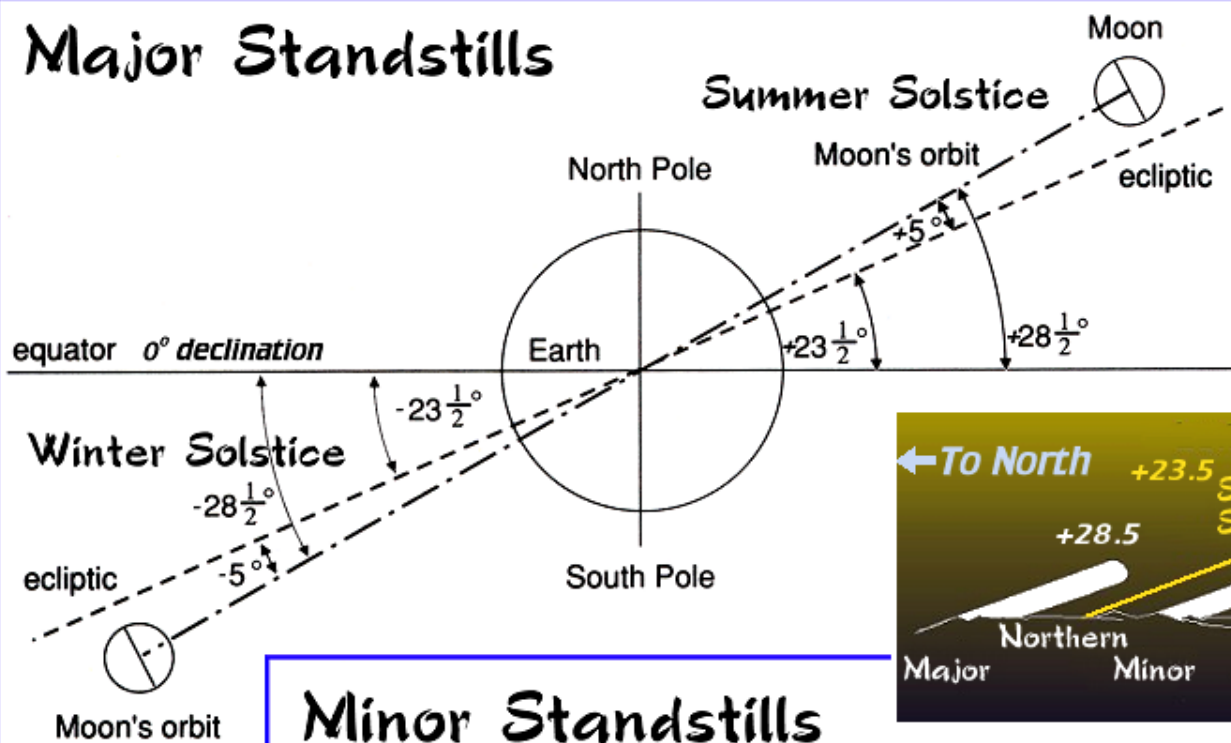
SW

SSE

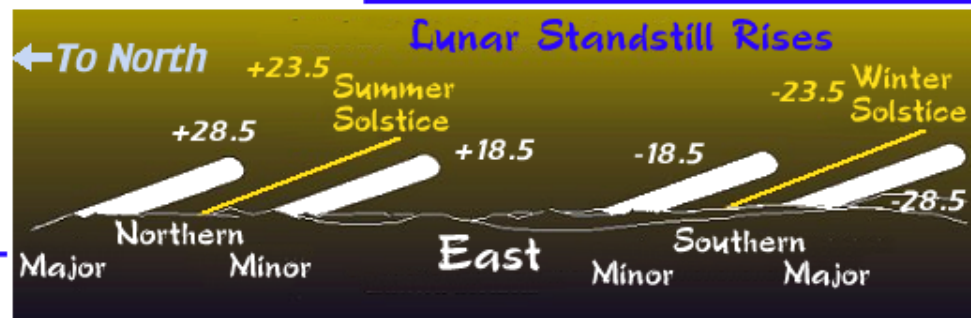
South

SSW

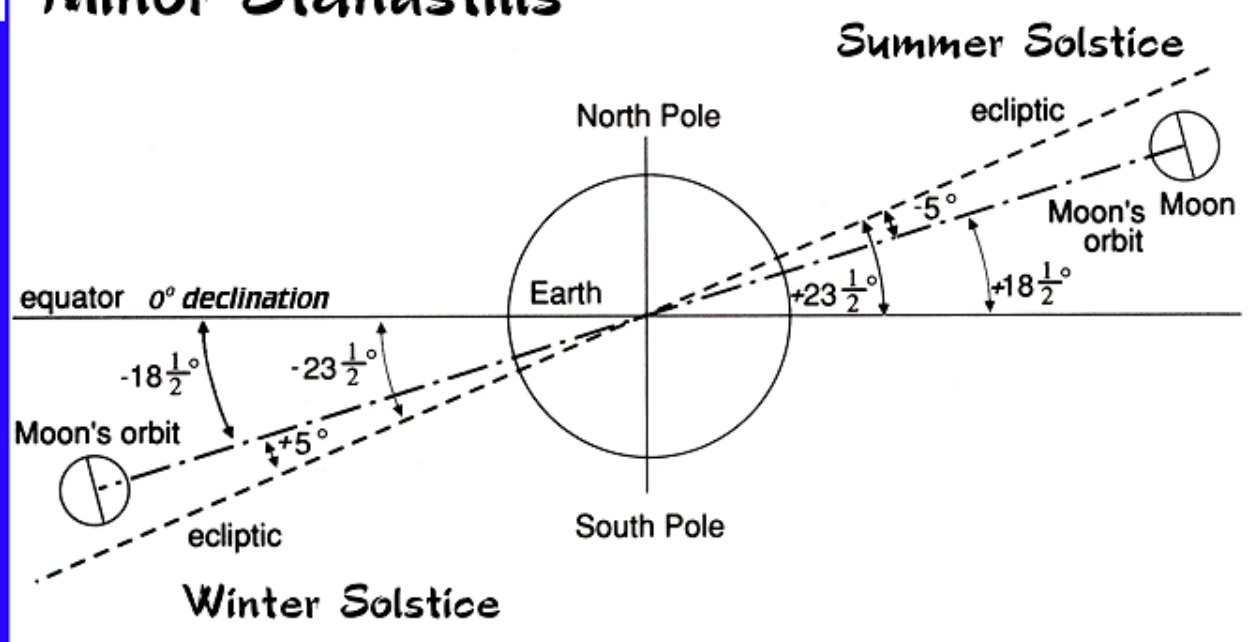
Major Standstills



Lunar Standstills



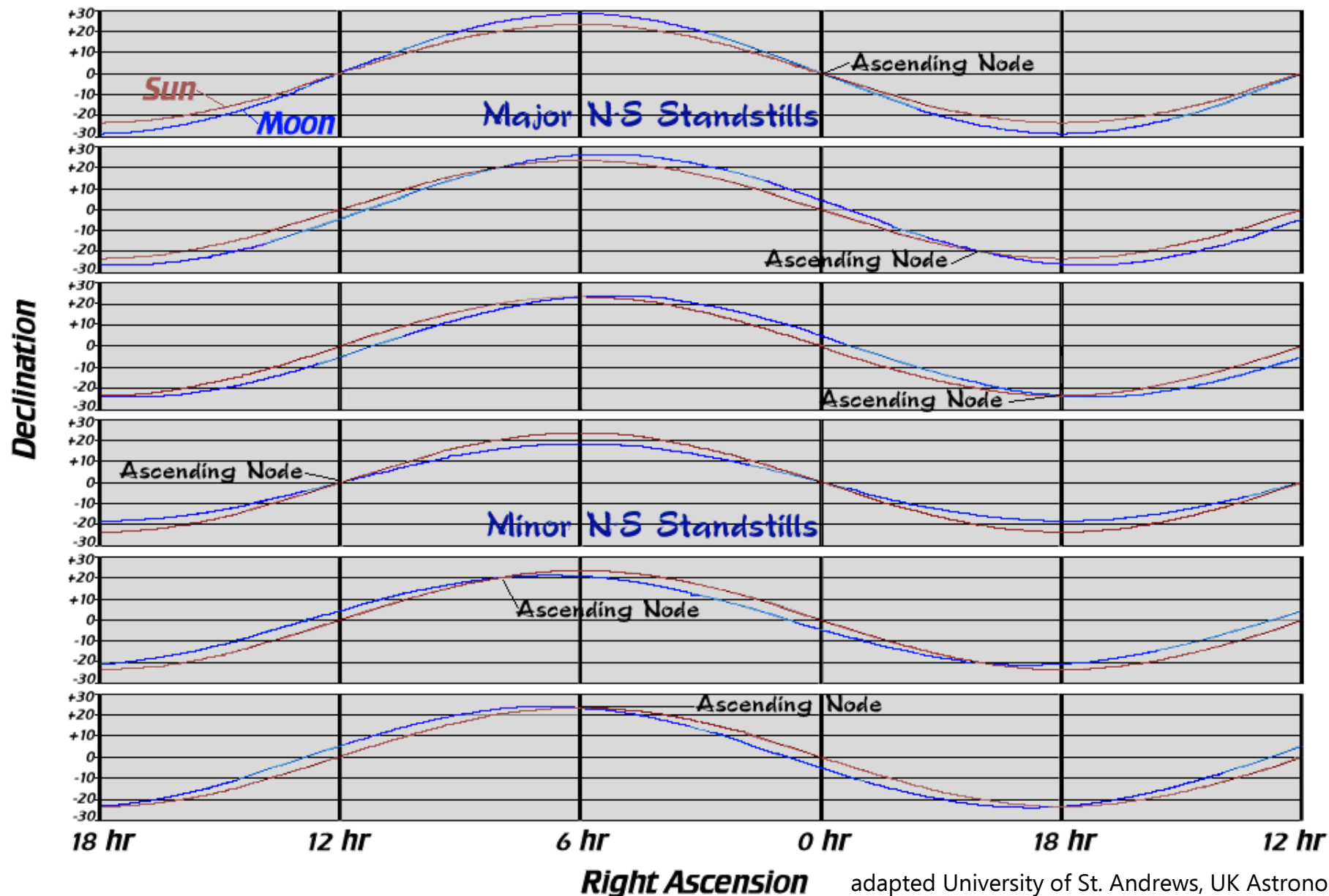
Minor Standstills



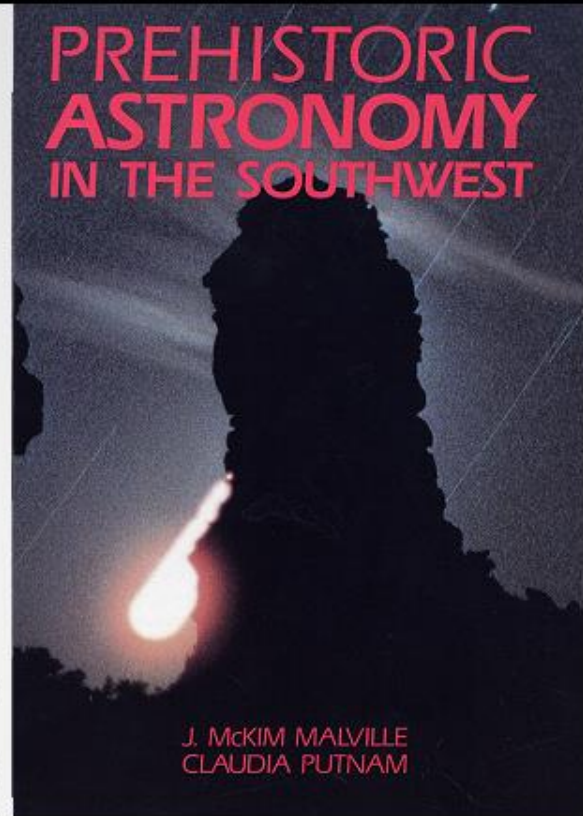
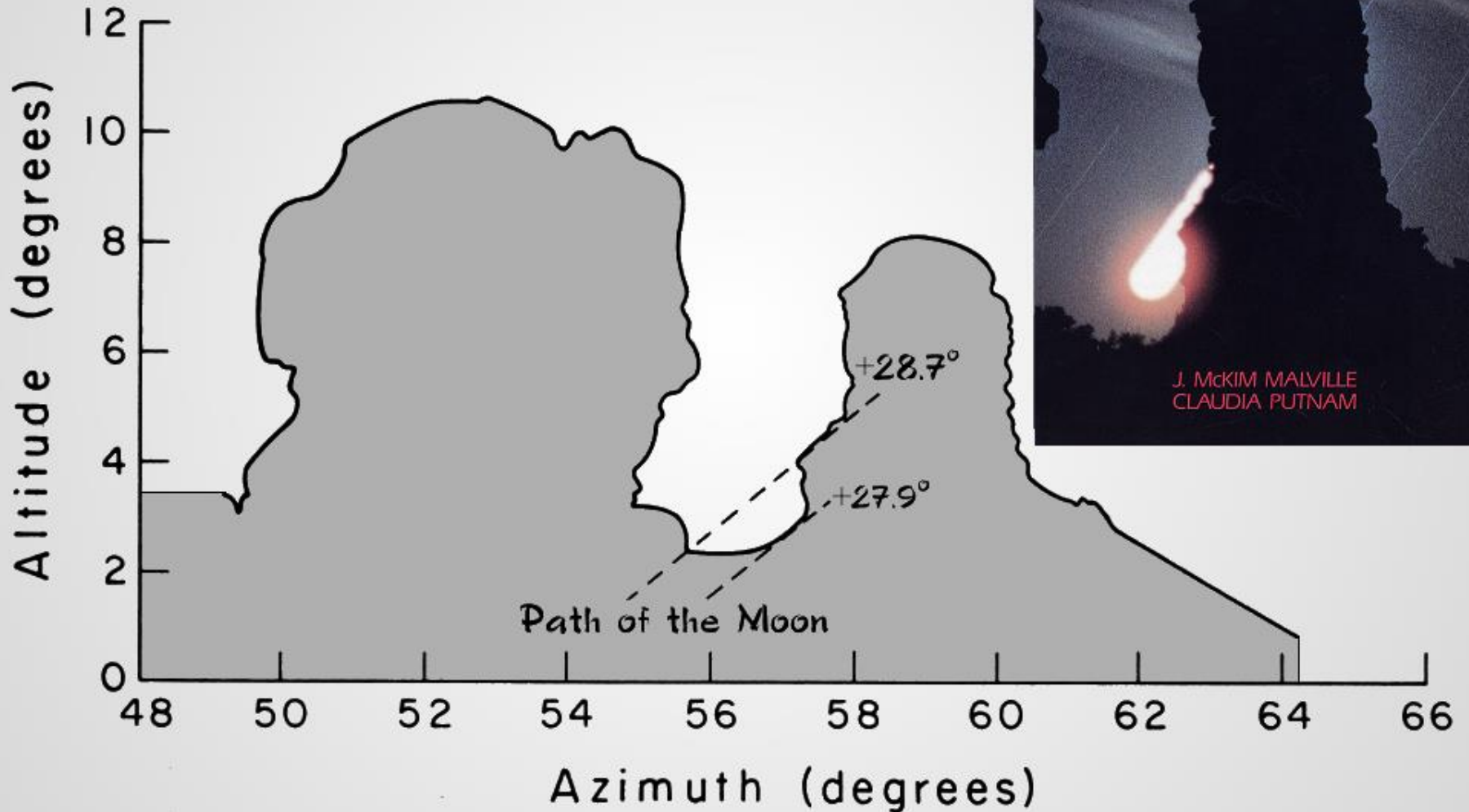
Adapted from Malvil'le and Putnam', Prehistoric Astronomy in the Southwest, p. 18

Understanding Lunar Standstills

← ← Sun and Moon Always Move Towards the EAST / Nodes Regress Westward → →



CHIMNEY ROCK MAJOR LUNAR STANDSTILL





Chimney Rock Major
Standstill Moonrise
(+28.5 degrees)