

Polarimeter to UNify the Corona and Heliosphere (PUNCH)

Why Our Outreach Program Embedded in a NASA Mission to Study the Sun Has no Target Audiences

Cherilynn Morrow, PhD
Outreach Director, NASA PUNCH Mission

Jayne Aubele
Co-Director for Cross-Cultural Outreach, NASA PUNCH Mission

Joe Aragon
Cultural Consultant, Pueblo of Acoma Tribal Member

ED12A Collaborate to Innovate: Science, Culture, and Community II Oral

American Geophysical Union 2023

San Francisco, CA

11 December 2023



<https://punch.space.swri.edu>



Outreach
for the
NASA
PUNCH
mission

PUNCH Outreach

[hidden slide for reference]

AGU Session Description

ED12A - Collaborate to Innovate: Science, Culture, and Community II Oral

Deepening participation in science with diverse audiences involves a shift in thinking from “outreach to” to “collaborating with”

This session explores the varied ways in which scientists and educators work together in culturally and contextually relevant ways.

Examples of these processes include co-design, co-development, citizen science, incorporating diverse ways of knowing, place-based learning, reciprocal partnerships, and pathways to elevate community interests.

It is vital to approach opening science wide with an **asset-based mindset** that is inclusive to all people regardless of race, gender, differing abilities, language, socio-economic status, and education.

We invite AGU members to join us as **we share our stories and consider issues related to involving publics in public engagement.**

What methods are you using that we haven't considered above? We invite abstracts from current implementation as well as ideas for unique implementation and discussion.



Outreach
for the
NASA
PUNCH
mission

ED12A-07 Why Our Outreach Program Embedded in a NASA Mission to Study the Sun Has no Target Audiences

- Monday, 11 December 2023 12:20 - 12:30
- 205-206 - South (Level 2, South, Moscone Center)

Abstract

The primary authors of this presentation are members of the Arts and Cross-Cultural POD that supports the multi-institutional PUNCH Outreach team.

Our team is integrated with the NASA PUNCH mission which is designed to study the Sun's outer corona and the "space weather" features that leave the outer corona and sweep through our inner solar system.

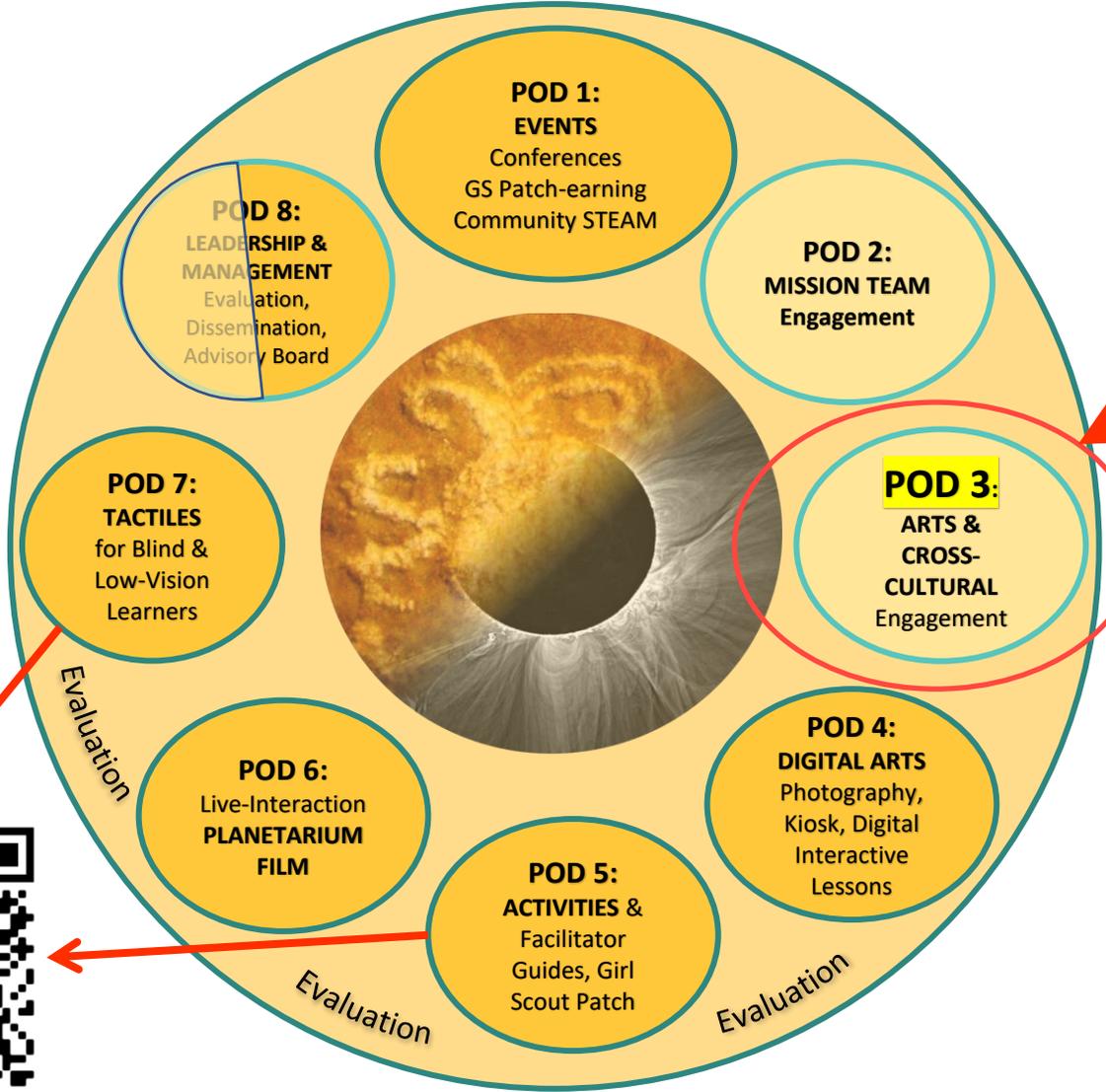
Our science is readily connected to the upcoming eclipses, and our more enduring outreach theme is *Ancient & Modern Sun-watching*.

This theme is succeeding in making NASA Heliophysics more personally and culturally relevant to a broader diversity of people.

The historically marginalized populations our mission team members are engaging and learning from are Native American and Spanish-speaking youth and families, blind & low-vision (BLV) learners, and Girl Scouts. We do not "target" them, nor are they in any sense "audiences", but instead are active participants and collaborators with whom we work to develop innovative, multicultural, multi-sensory products and events that are enriching for everyone.

Our presentation will offer **four specific examples** about how our collaborations have led to innovations of benefit, not only to the marginalized community, but also to the broader population. We will **emphasize our experience and lessons learned via our collaboration with an 8th grade science class at the Haak'u Community Academy at the Pueblo of Acoma, New Mexico.**

PUNCH Outreach Domains (PODs):
Product Development: PODS 1 and 4-7
Relationship Development: PODs 2, 3, and 8



Haak'u Community Academy
Mission Statement
 HCA will develop self-confident students prepared to become future leaders through culture, language and academics.



9/17/2021



Populations We are Collaborating With and Learning From



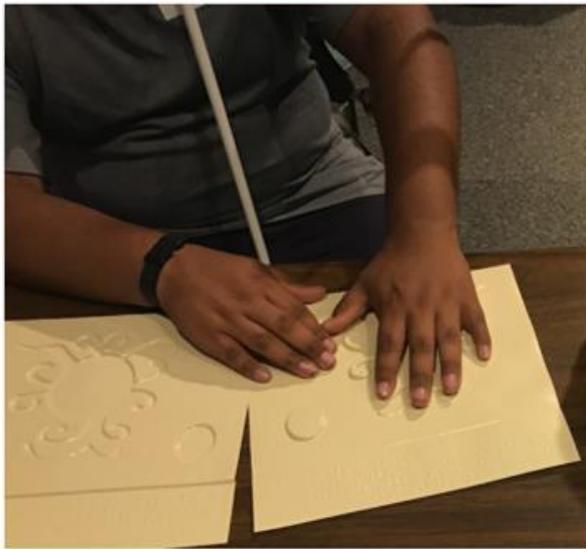
We made these choices to align with attributes of the PUNCH mission, strengths & interests of the Outreach and Science teams, and regional demographics.



Native American & Hispanic/Latinx youth & families



Learners at the Haak'u Community Academy at the Pueblo of Acoma



PUNCH Outreach field tests all its products and learns from scientists, Blind & Low Vision learners, the descendants of Ancestral Puebloan people, and other collaborators how to be of greater benefit to ALL people.

Blind & Low-Vision (BLV) Learners

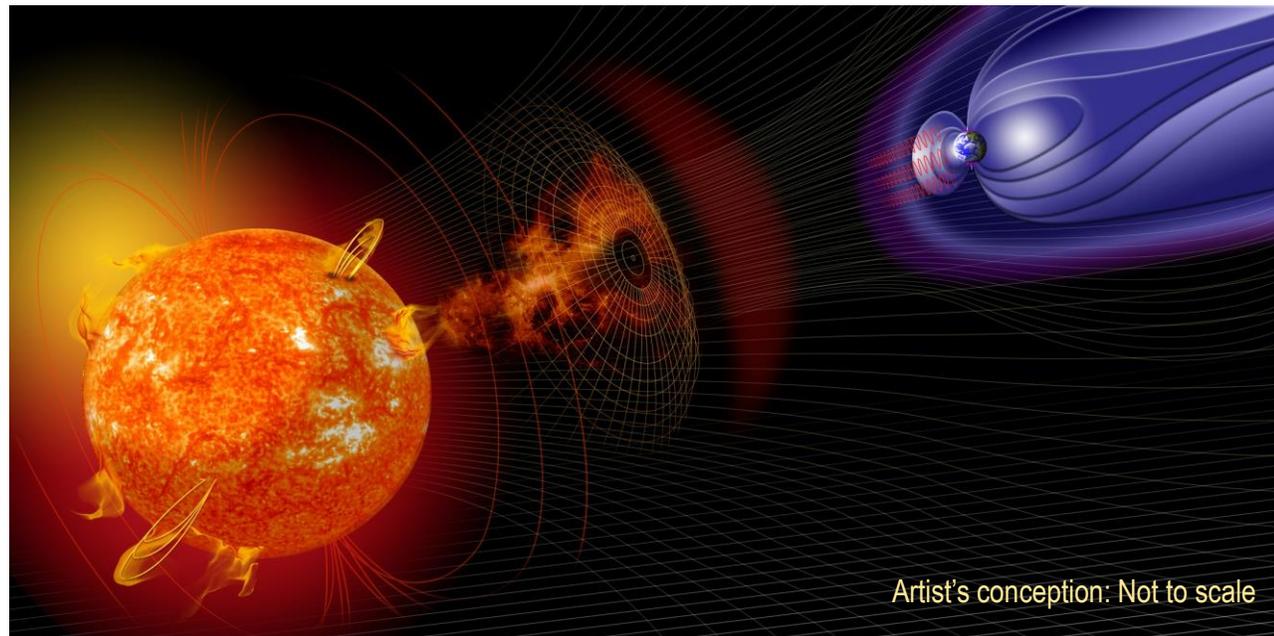
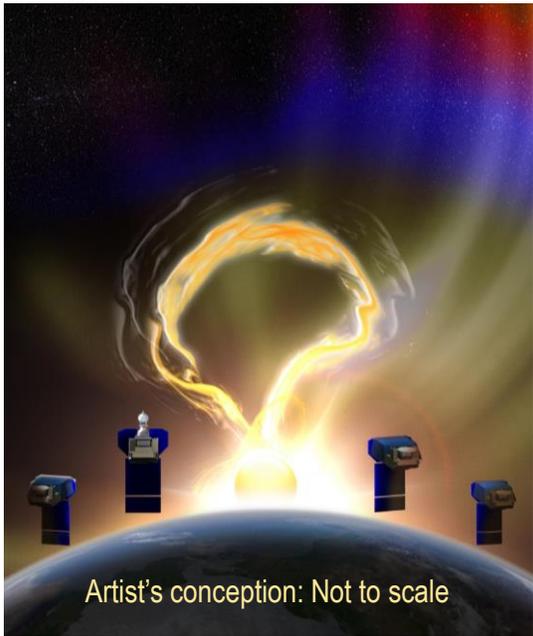


Girls in STEM



PUNCH is designed to study how the solar corona transitions into becoming the solar wind.

PUNCH offers pioneering capacity for tracking solar storms and other “space weather” features between Sun and Earth.



**PUNCH is currently scheduled for launch in 2025* -- near the end of a period of high solar activity.
Of course the eclipses could not be postponed. 😊**

* Launch date is subject to change

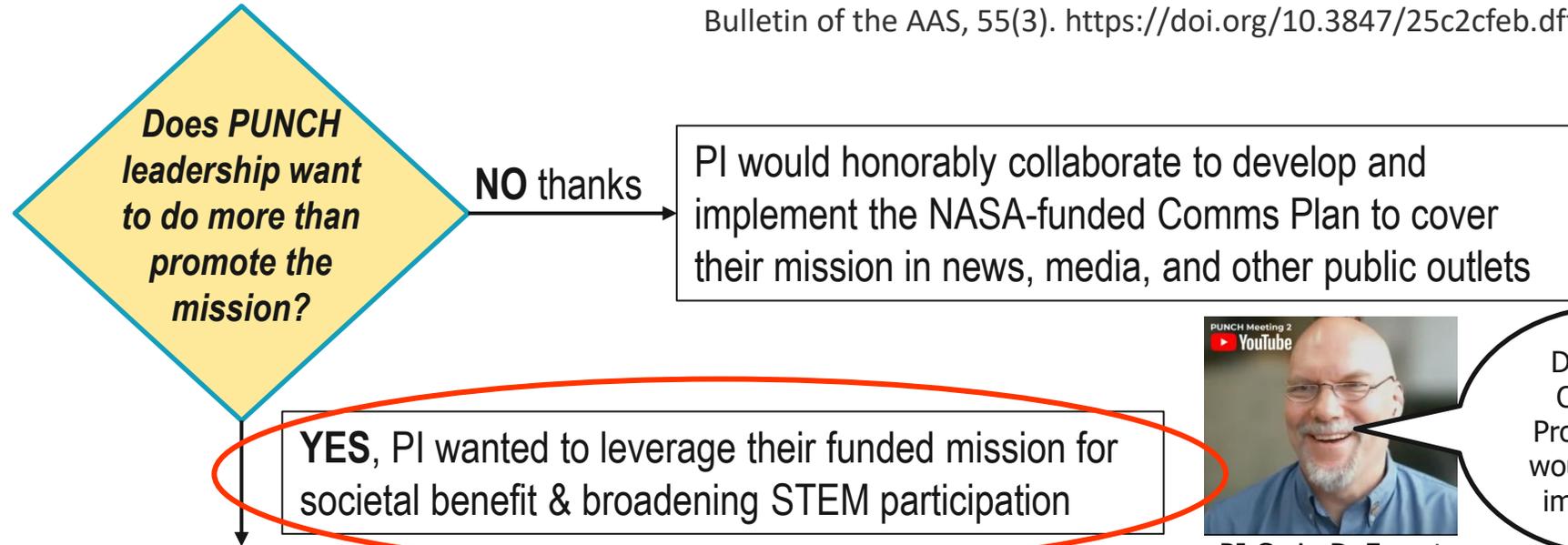


REMINDER: Origins of the PUNCH Outreach Program (topic of Decadal White Paper)

Morrow, C., DeForest, C., Buxner, S., & Gibson, S. (2023). *Support for a New and Improved Approach for NASA Mission-Embedded Outreach*. Bulletin of the AAS, 55(3). <https://doi.org/10.3847/25c2cfef.dffd9f46>



Decadal White Paper



PI Craig DeForest



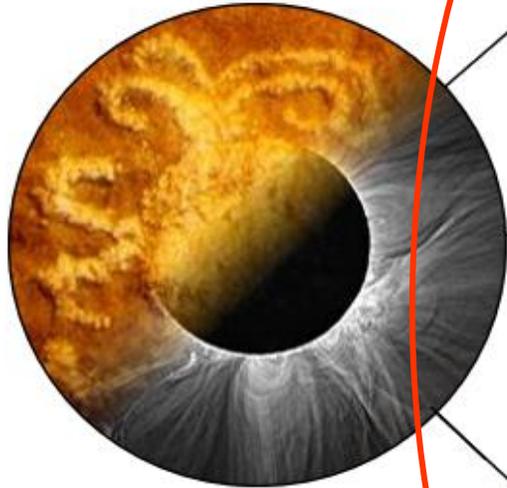
1. PI identified, hired, and supported an Outreach Lead with strong professionalism (soon *after* mission selection) who was charged with building an Outreach team and developing a rigorous plan during Mission Phase B.
2. PI collaborated with their Outreach Lead to develop & submit a proposed Outreach Plan to NASA Heliophysics
3. PUNCH received NASA augmentation to the mission budget to implement the Outreach Plan
4. The PI and Project Scientist (Sarah Gibson) welcomed the Outreach Team to the Mission Team and integrated their participation with Science and Communications Teams + web developer Don Kolinski.

Sarah Gibson
PUNCH Project Scientist



Shining New Light on Diverse Views of the Sun

Elements of the
PUNCH Outreach
Ancient & Modern
Sun Watching Theme

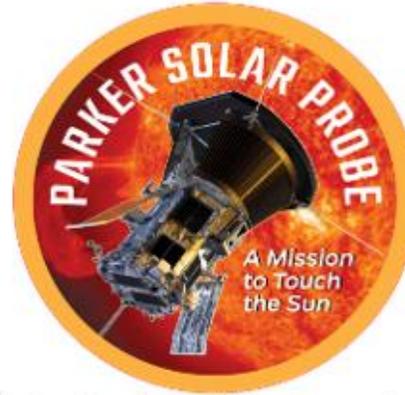


NASA
Heliophysics
Missions

Ancient
Sun Watching
in Chaco
Culture

Personal Sun
Watching

Funded collaboration between PUNCH and Parker on planetarium films and openness to collaboration with other missions



NASA Exploration of the Sun is a natural extension of age-old human practice of observation of the Sun rhythms and mysteries. There is world-wide evidence that all human beings are descended from cultures who observed the Sun.



There are >20 indigenous tribes in the 4-Corners region and Mexico who have ancestral and historical ties to Chaco. Chaco is also a World Heritage site with extraordinary evidence of ancient solar observing and thus has broader appeal.

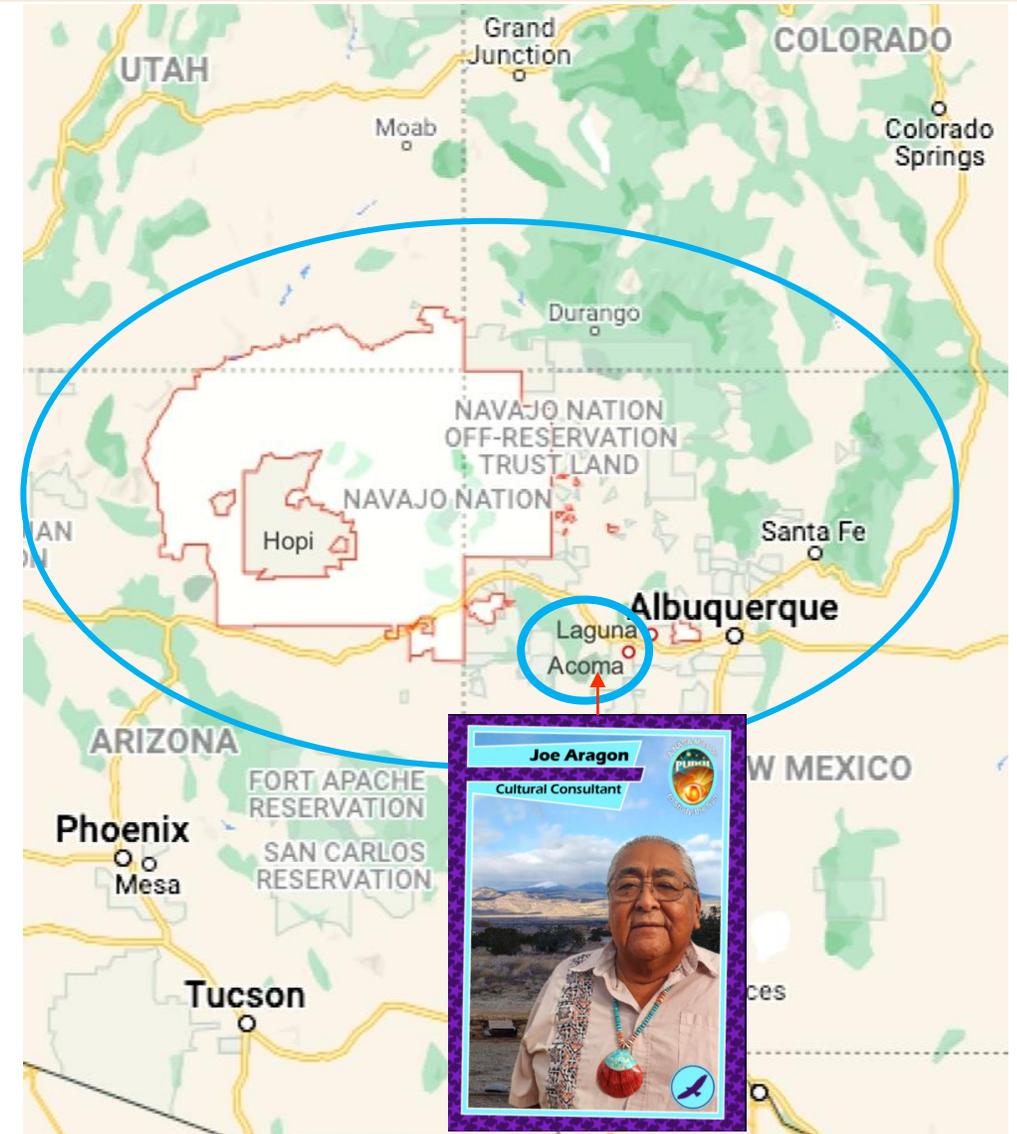
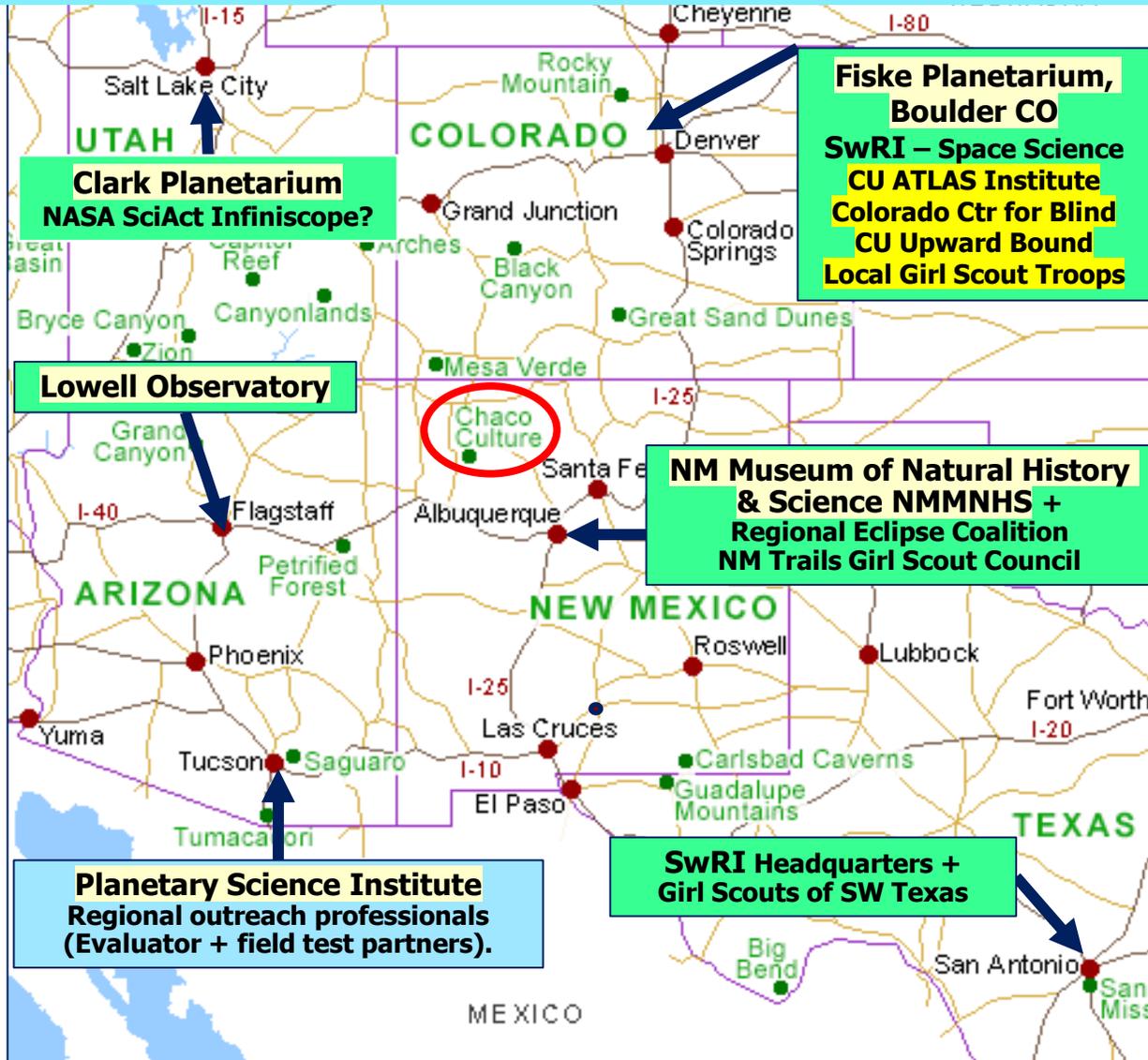


"Modern Sun Watching" includes the invitation to ALL contemporary people to be present for sunrise, sunset, light & shadow effects, and eclipses.

Our outreach theme makes NASA Sun science relevant to **diverse learners** via **personal & cultural connections to Sun-watching.**

PUNCH Outreach Core Collaborative exemplifies the power of a mutually beneficial “**Stone Soup**” collaboration that radiates beyond our region via dissemination partners (e.g., NASA Comms, SciAct, ASP, AAS)

NO “Target Audiences”. We collaborate with historically marginalized populations to develop multicultural, multisensory products and events of benefit to everyone.





4. Enacting a thematic approach to broaden participation

[Our “Ancient & Modern Sun-watching” theme enhances personal & cultural connections to NASA Heliophysics.]

6. Leveraging strengths & partnerships among multiple institutions

[Our “Stone Soup” Collaborative => More opportunities for field-testing & evaluation with more diverse learners/participants/collaborators.]

7. Learning from those we intend to benefit from the start

[“No target audiences” => “Active collaborators.” Bringing marginalized voices to the mainstream to benefit all]

8. Using evidence-based practices & integrating evaluative processes

[“Front-end evaluation of needs” => “Ongoing conversation and alertness to new solutions & opportunities” – **POD 3 mission.**]

[“Field testing” => “NASA Collaboration”]

Four of the Eight Guiding Principles in the PUNCH Outreach proposal submitted to NASA in Nov 2020



Mr. Aragon loves telling Pueblo students about their ancestral connection to Chaco



“I am interested in the overlap of cultural significance and NASA science learning that is possible...”

“This project can provide a way for our Acoma students to experience NASA science and envision a future career in science, without losing touch with their culture.”

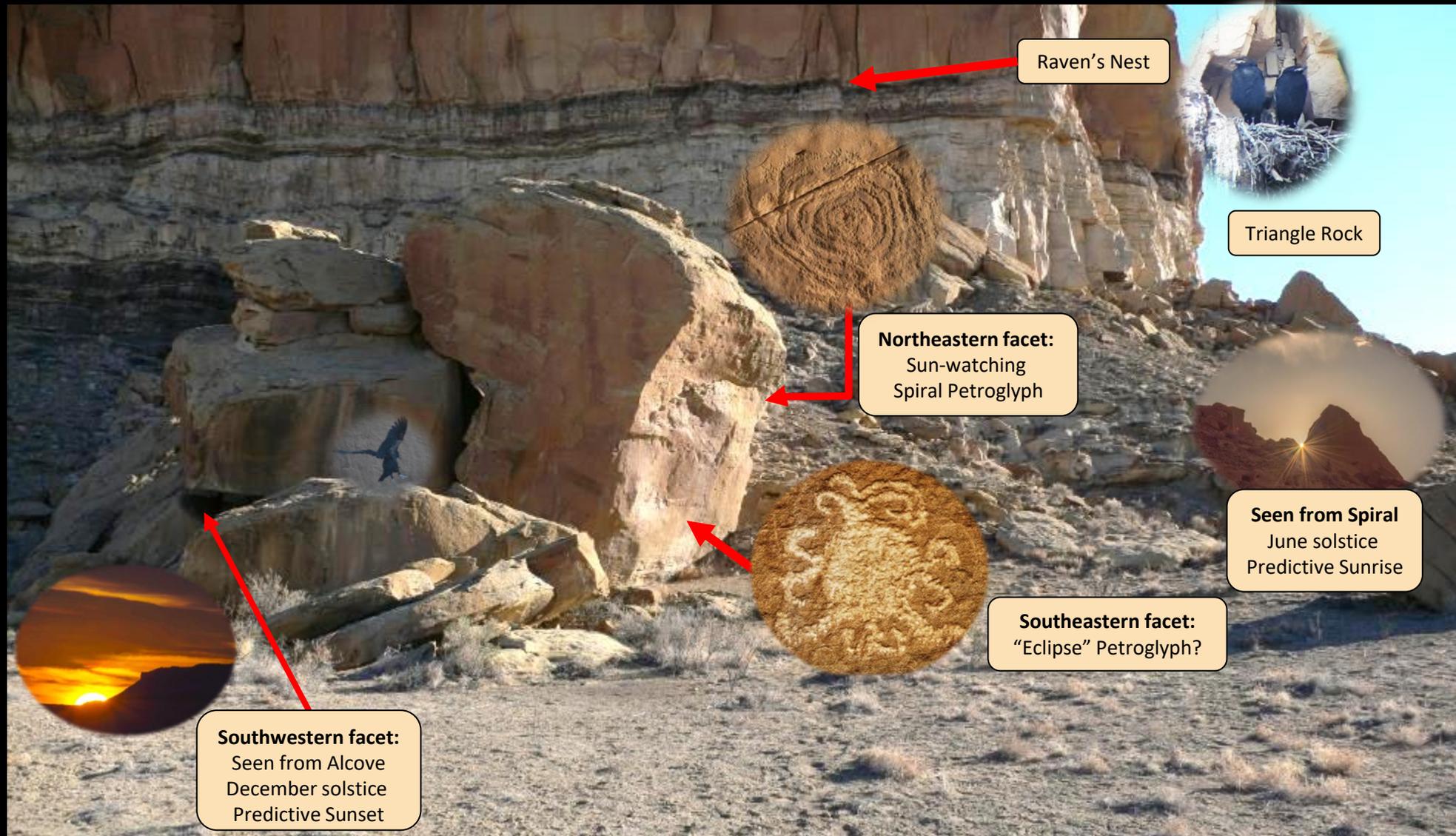
Joe Aragon
STEM Educator (retired), Acoma Pueblo, NM
PUNCH Outreach Cross-cultural consultant

Chaco Canyon: *Rock of the Sun* Predictive SUNSET for Winter Solstice ~ 7 December



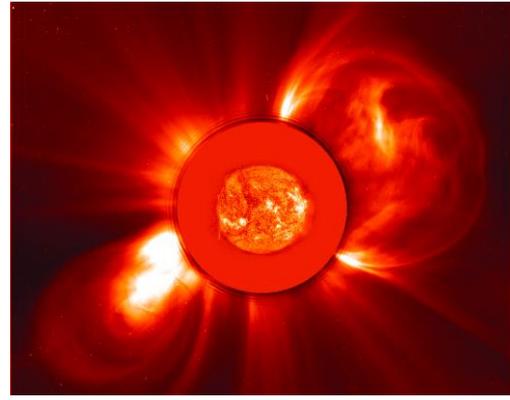
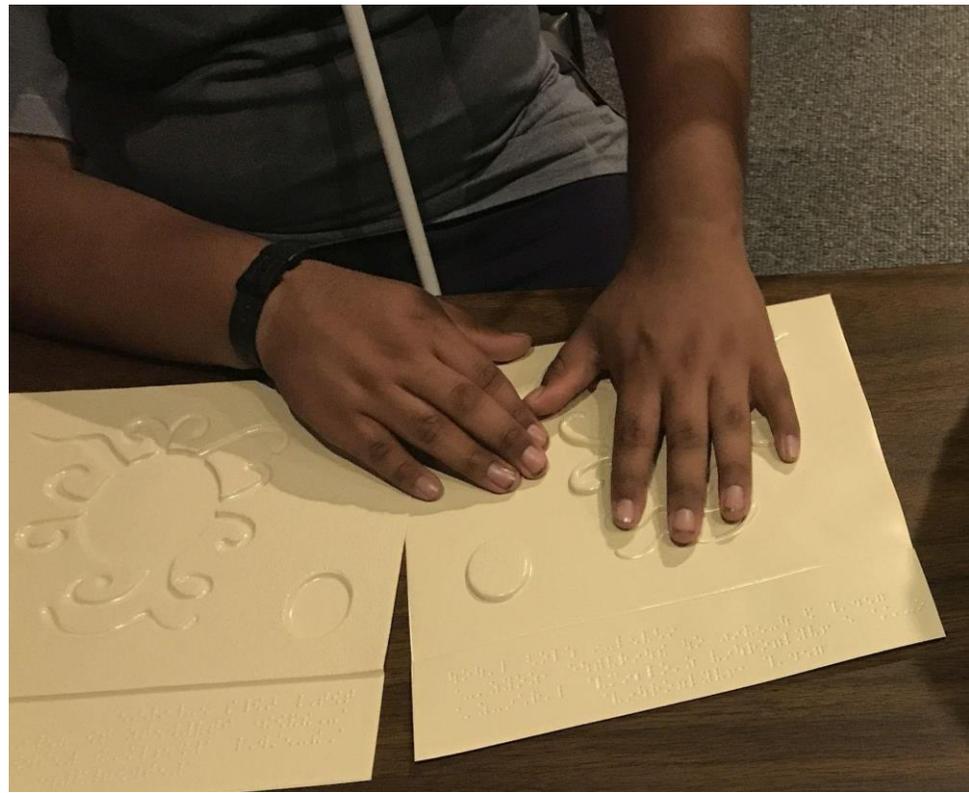
Rock of the Sun in Chaco Canyon, New Mexico

Receipt of photography with gratitude and respect



Examples of Thermoform Tactile-Art Representations of the Solar Corona

Our Field-testing IS Collaboration



NASA spacecraft image, 2000



Hand drawing, 1860



Chaco Petroglyph, 1097?



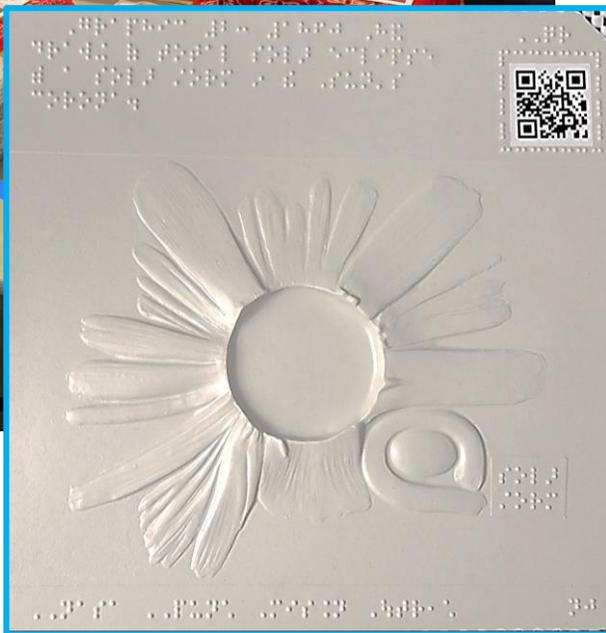
Thermoform Tactile-Art interpretations by Dr. Nicole Johnson

A student from the *Colorado Center for the Blind* **collaborates** on the development of our tactile-art representations of the Sun's corona.

Imminent delivery of 500 7-Tactile sets to the *Astronomy Society of the Pacific* for distribution to their *Eclipse Ambassadors* nationwide



We have adapted our tactile-art of the solar corona for use with *sighted* learners in an activity we call *Seeing with Your Hands*

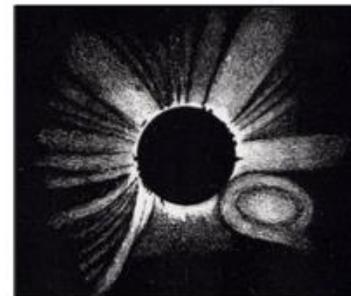


Pay close attention to details that can distinguish these images. Which of these images are you "seeing with your hands"?

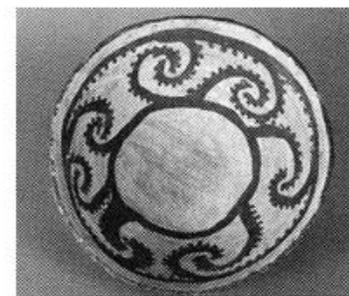
A Ancient petroglyph in Chaco Canyon (1097?)



B 1860 hand drawing of a total solar eclipse



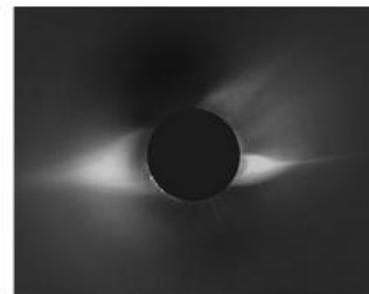
C Pottery bowl from Chaco Culture (11th century?)



D Photo of eclipsed Sun at solar maximum (1980)



E Photo of eclipsed Sun at solar minimum (1994)



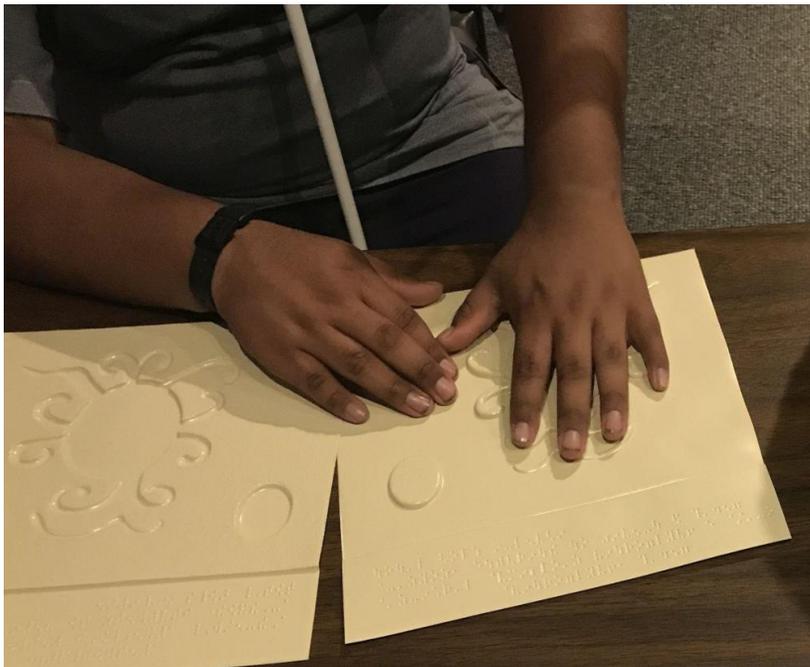
F Sunflower





COLLABORATE to INNOVATE and DISSEMINATE

Colorado Center for the Blind
field tester at *Fiske Planetarium*
Boulder CO



Sighted visitors at the NM Museum of Natural History and Science field testing "Seeing with Your Hands"
Albuquerque, NM



Conference attendee Cary Supalo
Am. Assoc. of Physics Teachers
Sacramento, CA





Looking Eastward across a *Great Kiva* in Chaco Canyon, NM

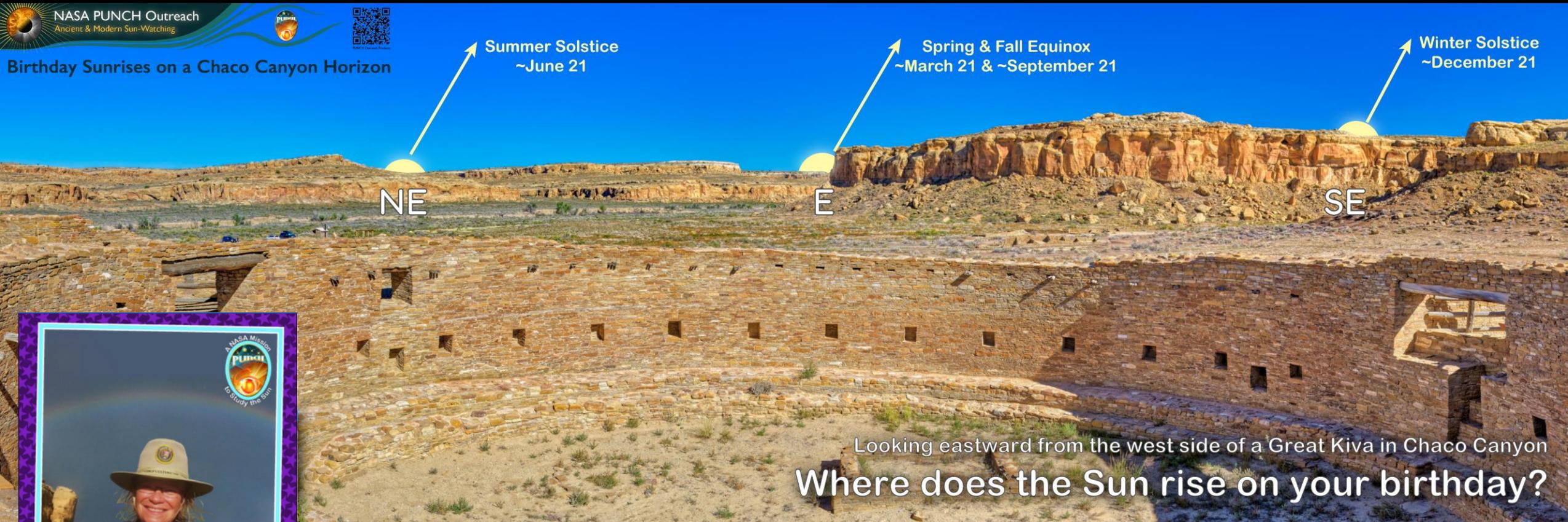
A marvel of astronomical alignments related to Sun and Moon cycles



Photography: PUNCH Outreach (D Johnson, Clark Planetarium, UT).

Birthday Sunrises on a Chaco Canyon Horizon

A PUNCH Outreach Activity



Looking eastward from the west side of a Great Kiva in Chaco Canyon
Where does the Sun rise on your birthday?

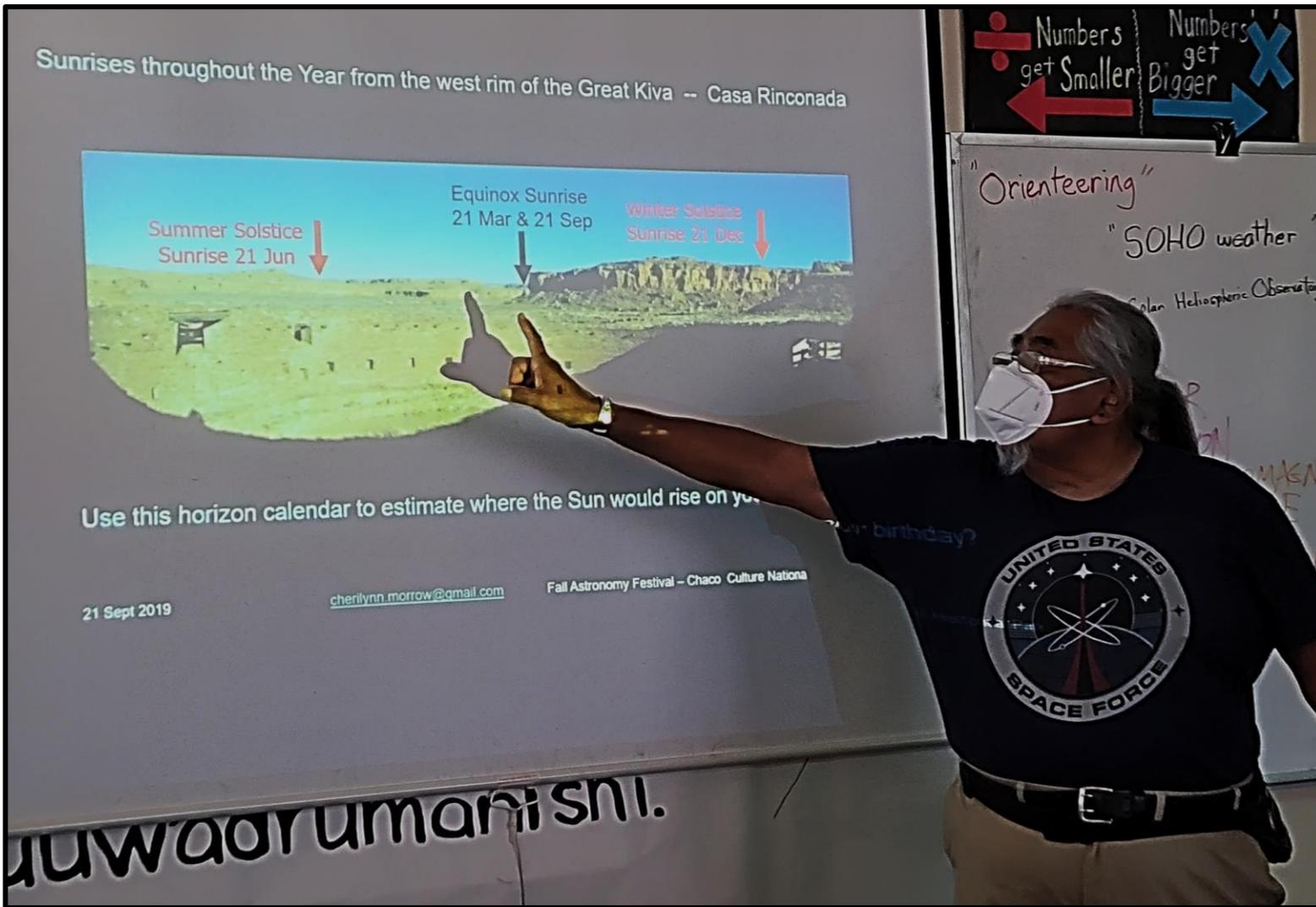
Credit PUNCH Outreach: Photography by D Johnson, Clark Planetarium, UT. Layout by B. Ingermann, Fiske Planetarium, CO. Sunrise positions by Ranger G B Cornucopia (retired).

The image above is downloadable and printable as a tabletop poster.





With our 8th grade collaborators at Acoma Pueblo we use multiple modalities to teach about the Sun and seasonal cycles.

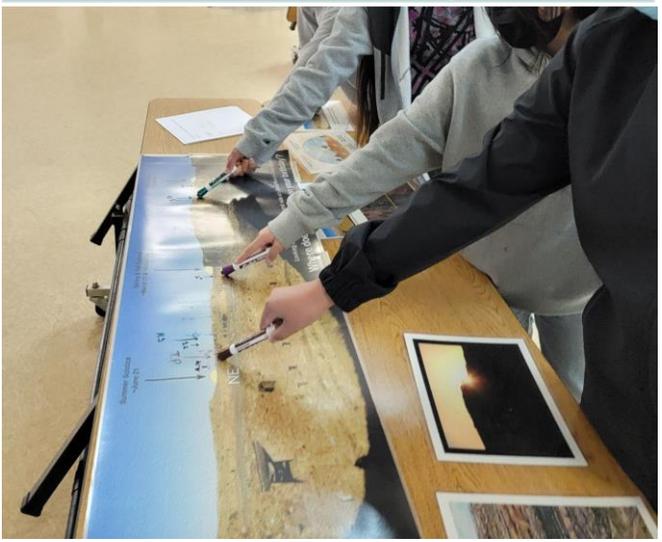


Birthday Sunrises on a Chaco Canyon Horizon

[inspired by Chaco visitors & Native American partners]



Haak'u Community Academy
Pueblo of Acoma, NM



Brownie Girl Scouts
Longmont, Colorado



National Society of Black Physicists
Knoxville, Tennessee (Nov 2023)



From Classroom to Community



At Acoma we are empowering the Sun-watcher in people of all ages

Annular Eclipse Event at the Pueblo of Acoma



Community Sun-Watching Events at the Pueblo of Acoma (Supported by PUNCH Outreach)

Olivia, age 7, teaches other children how to use our 3-Hole PUNCH Pinhole Projector



Joe Aragon
Cultural Consultant

A NASA Mission
PUNCH
To Study the Sun



Joe Aragon

he/him

As a **Cultural Consultant**, I help to provide Native American cultural awareness related to the study of the Sun. I use my education in physics and math to create activities that allow young people to learn about NASA science in culturally relevant ways.

Inquisitive, Open, Willing to share

FUN SUN FACT

The Sun provides heat, light, electrical power, and helps us to grow food. When I was a newborn child, my family introduced me to the Sun with my first traditional name. This began my lifelong way of being thankful for the Sun's gifts.

WORDS THAT HELP GUIDE ME

Respect everyone's opinion, because they know something - however small - that you do not.
- Joe Aragon Sr. (my father)

INSPIRING ANIMAL

My mother's clan is the Eagle Clan. The **eagle** inspires me to do my best for the world and all living things.

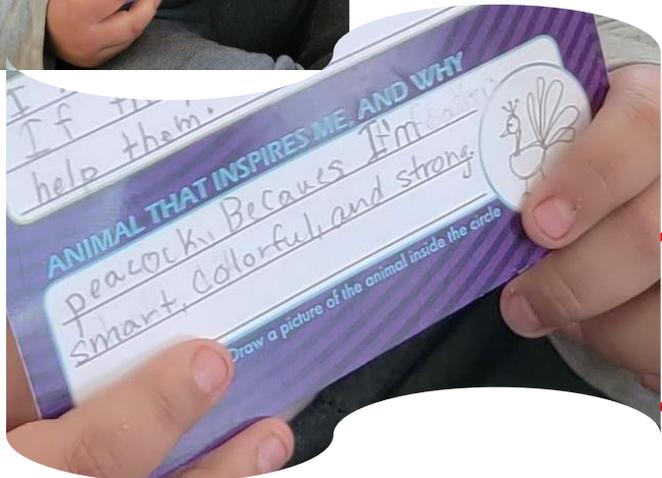
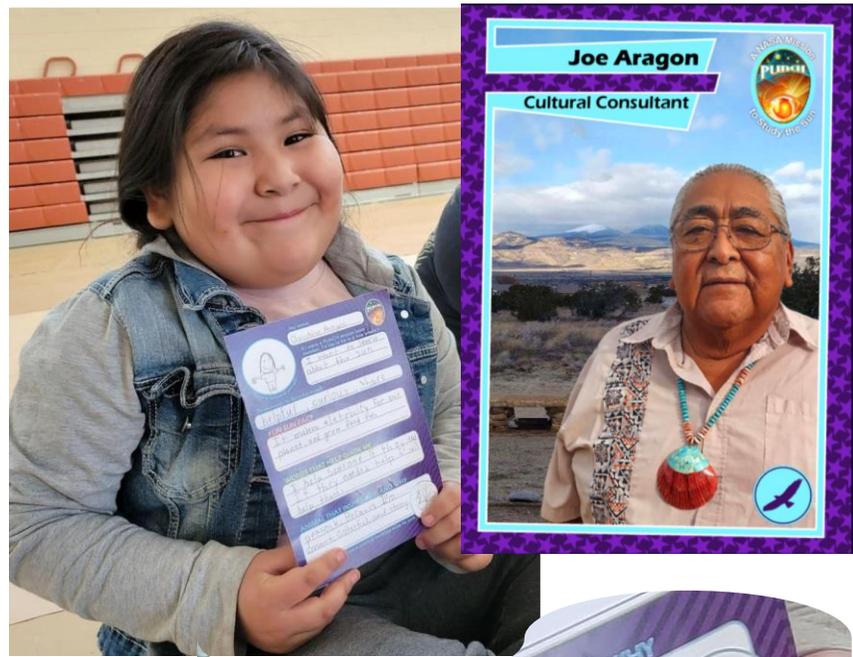




NASA Space Science is for Everyone!



Acoma Sun Fun Day – May 2023
We learned that our “Create Your Own Card” activity could become a family affair!



My name: Christine

If I were a PUNCH mission team member, I'd like to be in a role where I: I want to learn about the Sun

Three words to describe myself: Helpful, Curious, Share

FUN SUN FACT
It makes electricity for our planet, and grow food too.

WORDS THAT HELP GUIDE ME
I help someone if they
If they needed help, I will help them.

ANIMAL THAT INSPIRES ME, AND WHY
Peacock because I'm smart, colorful, and strong

Draw a picture of yourself

Draw a picture of the animal inside the circle

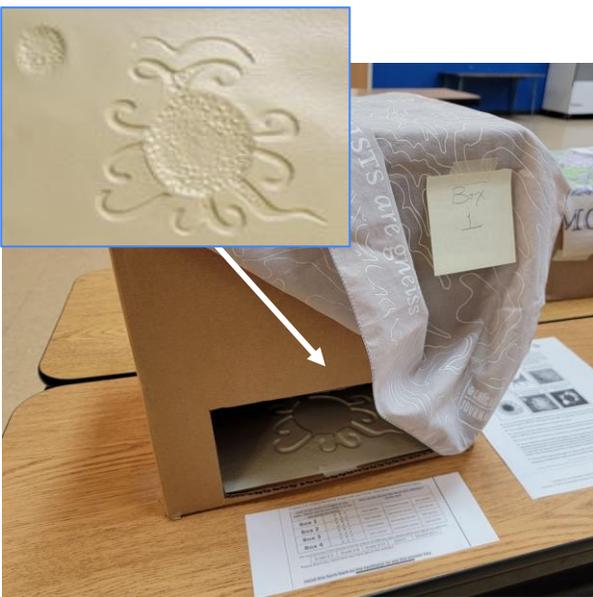




Birthdays on Chaco Horizon



'Seeing' with Your Hands



PUNCH Team Cards





Visit the NASA Booth
Mon: 4:30-6pm. Tues: 10-noon.

Visit our webpage:

- Outreach activities
- Facilitator guides
- Instructions to print/access materials
- Info on PUNCH science
- Other resources to stay connected



Outreach
for the
NASA
PUNCH
mission



https://punch.space.swri.edu/punch_outreach_products.php

OUTREACH PRODUCTS

PRODUCTS FOR ENGAGING LEARNERS OF ALL AGES

- 3-Hole PUNCH Pinhole Projector**
Find printing instructions & resources to REALLY understand how the round Sun can be imaged through "no" holes. **Spanish language version now available!**
- PUNCH Team Cards**
See the beautiful 3-D formatting as you meet diverse members of the NASA PUNCH Team.
- Sun Fun Fill-in-the-Blanks**
Play an online "drag & drop" word game to learn about the Sun and its effects on Earth.
- What is Heliophysics?**
Web page that mirrors the PUNCH Science Objectives with more basic explanations.
- Seeing the Sun's Corona with your Hands**
Explore tactile art representations of the Sun's corona, from an ancient petroglyph to NASA spacecraft imagery.
- Birthday Sunrises on a Chaco Canyon Horizon**
Learn how the sunrise position changes throughout the year on an eastern horizon viewed from a Great Kiva in Chaco Canyon.
- Dancing Up A Solar Storm**
Use body motions to represent key features of "space weather" before playing a dance-based learning game about levels of solar activity.