

# Polarimeter to UNify the Corona and Heliosphere (PUNCH)

*Proposed companion acronym: People Unifying Naturally with their Cosmic Home*

## Celebrating PUNCH Outreach

for the

### PUNCH 5 Science Meeting

20-21 June 2024 in Boulder, CO

Cherilynn Morrow

PUNCH Outreach Director

Consultant, Southwest Research Institute

John Keller and Thor Metzinger, Fiske Planetarium, CO

Duke Johnson and Jason Trump, Clark Planetarium, UT

Jayne Aubele & Geoff Skelton, NM Museum of Natural History & Science

Sanlyn Buxner, Planetary Science Institute, AZ

GB Cornucopia, Mike Zawaski and Stacy Wolff

Joe Aragon, Pueblo of Acoma

and the rest of the remarkable PUNCH Outreach Team!

**Special Presentation this evening by dancer Alexandra Lockhart**



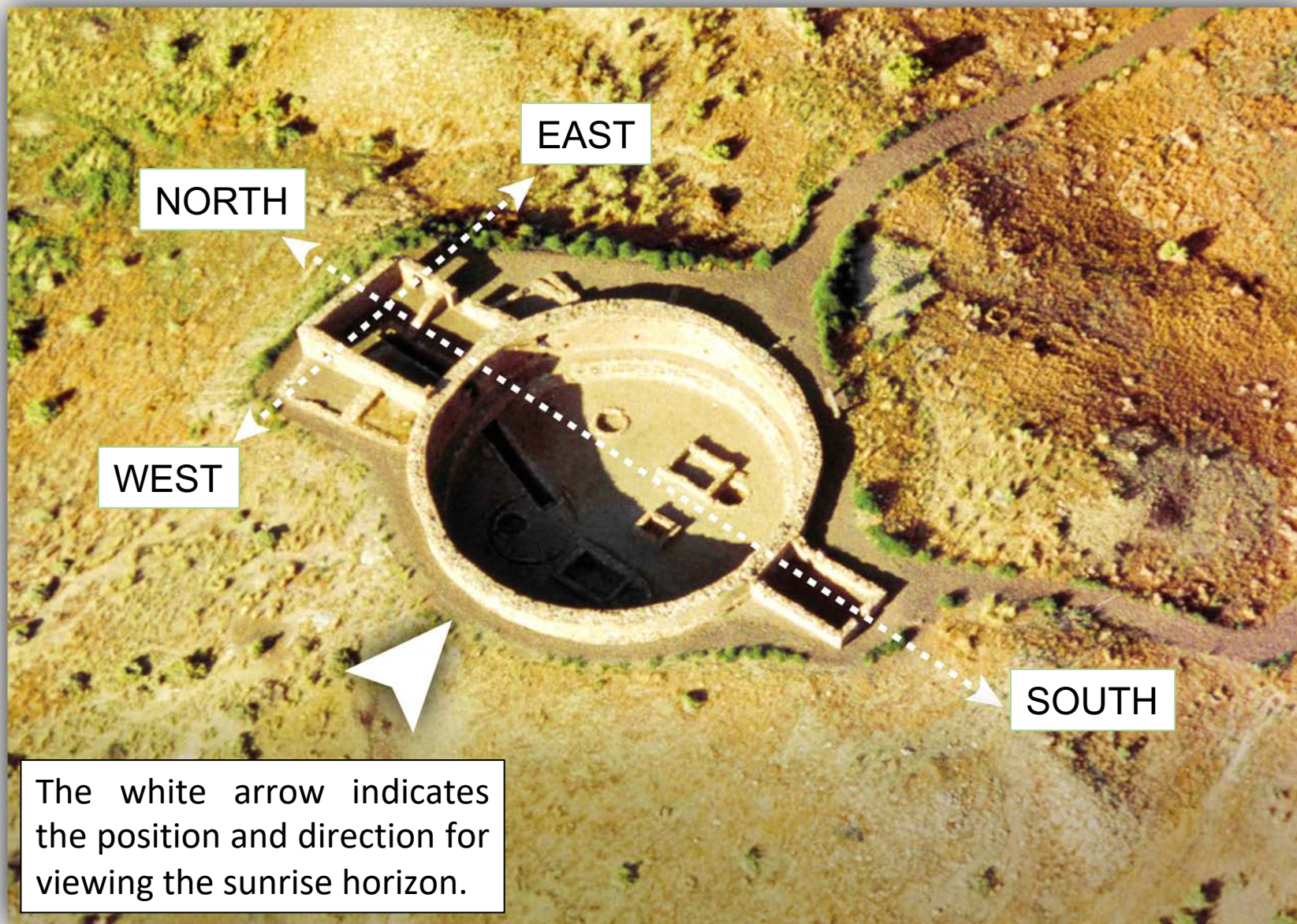


Happy Solstice!





# Aerial View: *Great Kiva* in Chaco Canyon, NM





Happy Solstice!

Summer Solstice  
~June 21

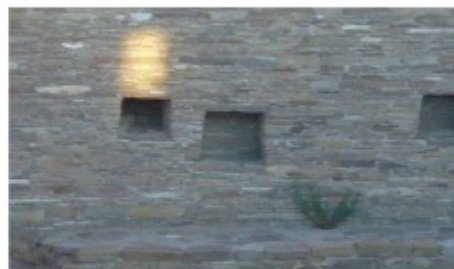
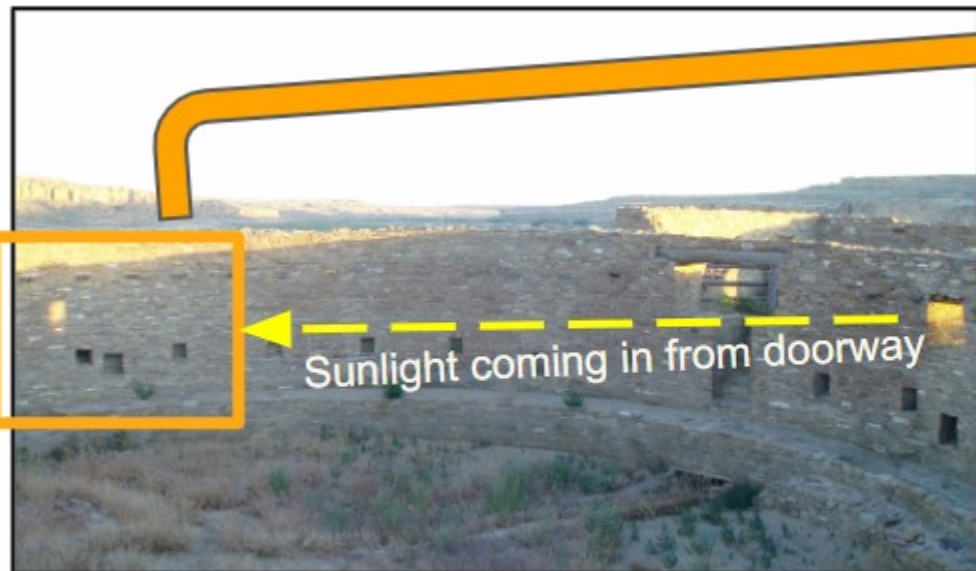
Spring & Fall Equinox  
~March 21 & ~Sept 21

Winter Solstice  
~December 21





# June Solstice Sunrise Interaction *Great Kiva* in Chaco Canyon, NM



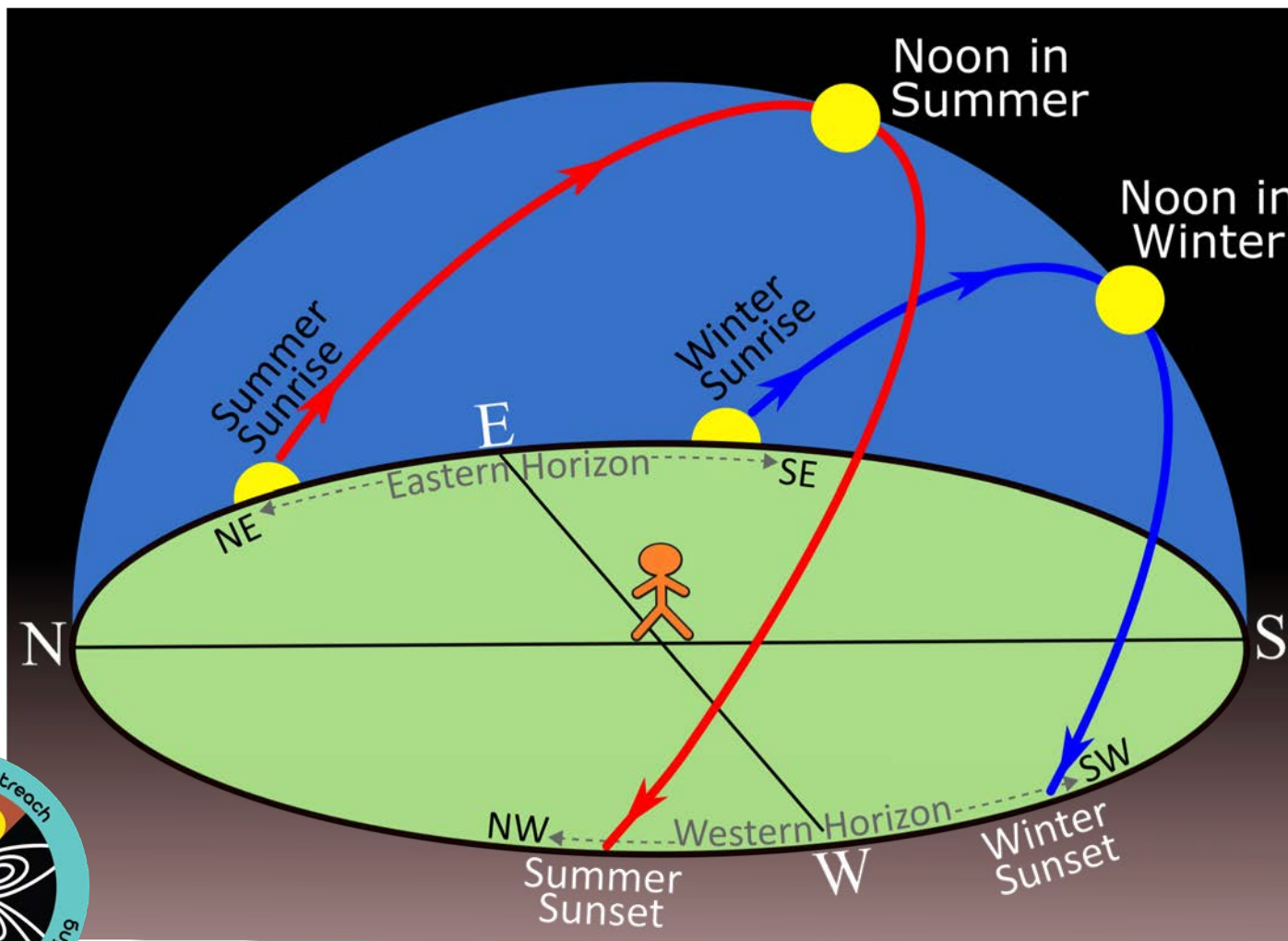
As the Sun rises in the northeast and rises up in the sky, the box of light shifts downward into a particular niche on the interior wall of the Great Kiva. You can visit Chaco during the summer solstice to see this interaction for yourself!





# Paths of the Sun in Summer and Winter

Orient yourself to the south and trace the highest & lowest paths of the Sun (which cause more & fewer daylight hours). This helps make sense of how the sunrise position changes on the horizon over the course of a year.



Activity: Birthday Sunrises on a Chaco Canyon Horizon

Contact: [punchoutreach@gmail.com](mailto:punchoutreach@gmail.com)



Happy Solstice!

Summer Solstice  
~June 21

Spring & Fall Equinox  
~March 21 & ~Sept 21



Winter Solstice  
~December 21



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



# AGU Conference December 2023

## SHOUT-OUTS:

Gilly Gilbert  
Sarah Gibson  
Nicki Viall  
Sanlyn Buxner







PUNCH Mission Scientist, Nicki Viall, is leading a renaissance among NASA Sun-watchers like yourselves – reminding us of the lost art & science of tracking and predicting the solar cycle of the seasons via sunrises and sunsets on a consistent horizon.





# PUNCH Outreach Theme: ANCIENT and MODERN Sun-Watching

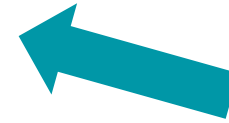




# ANCIENT Petroglyph

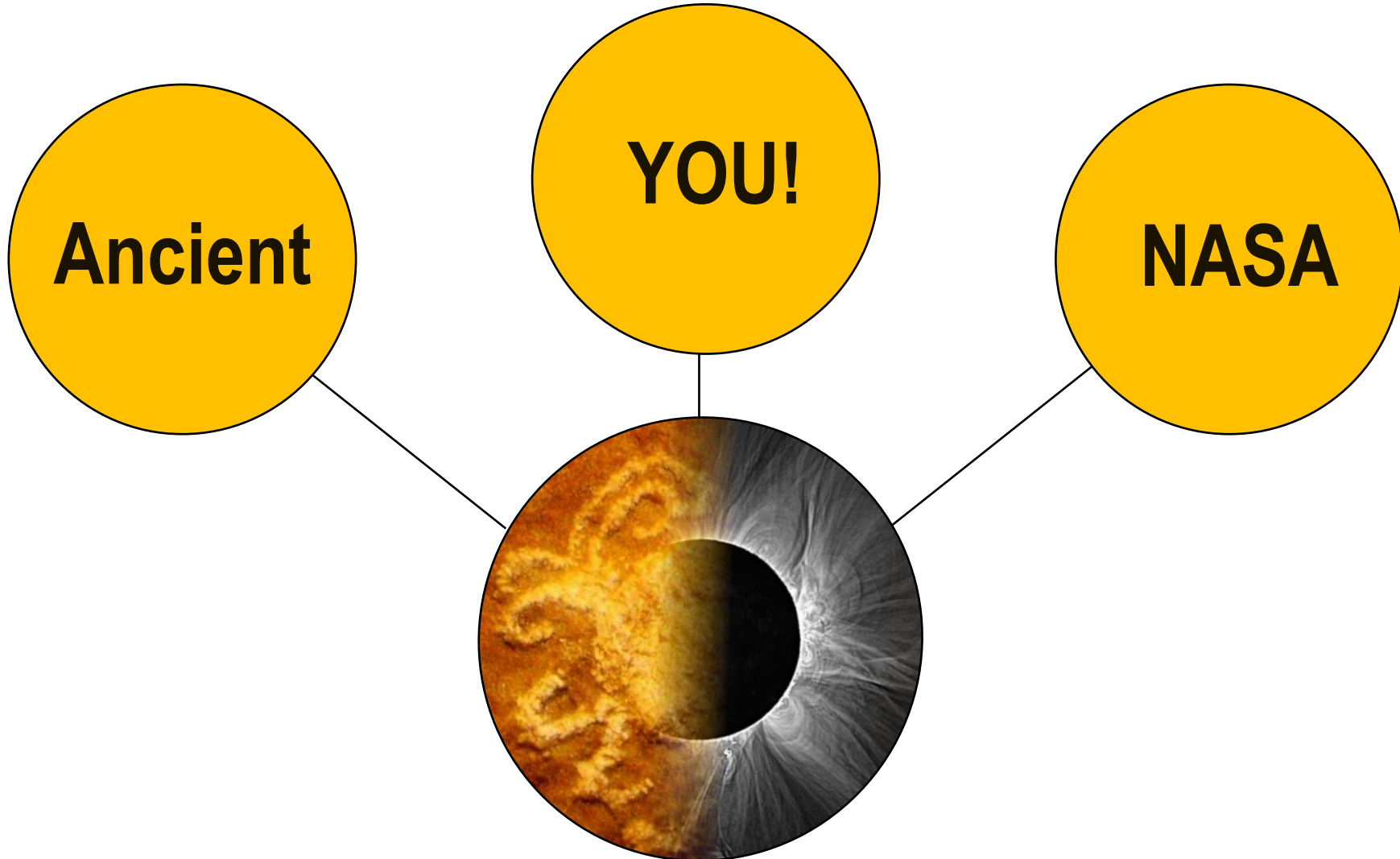


# MODERN Photograph



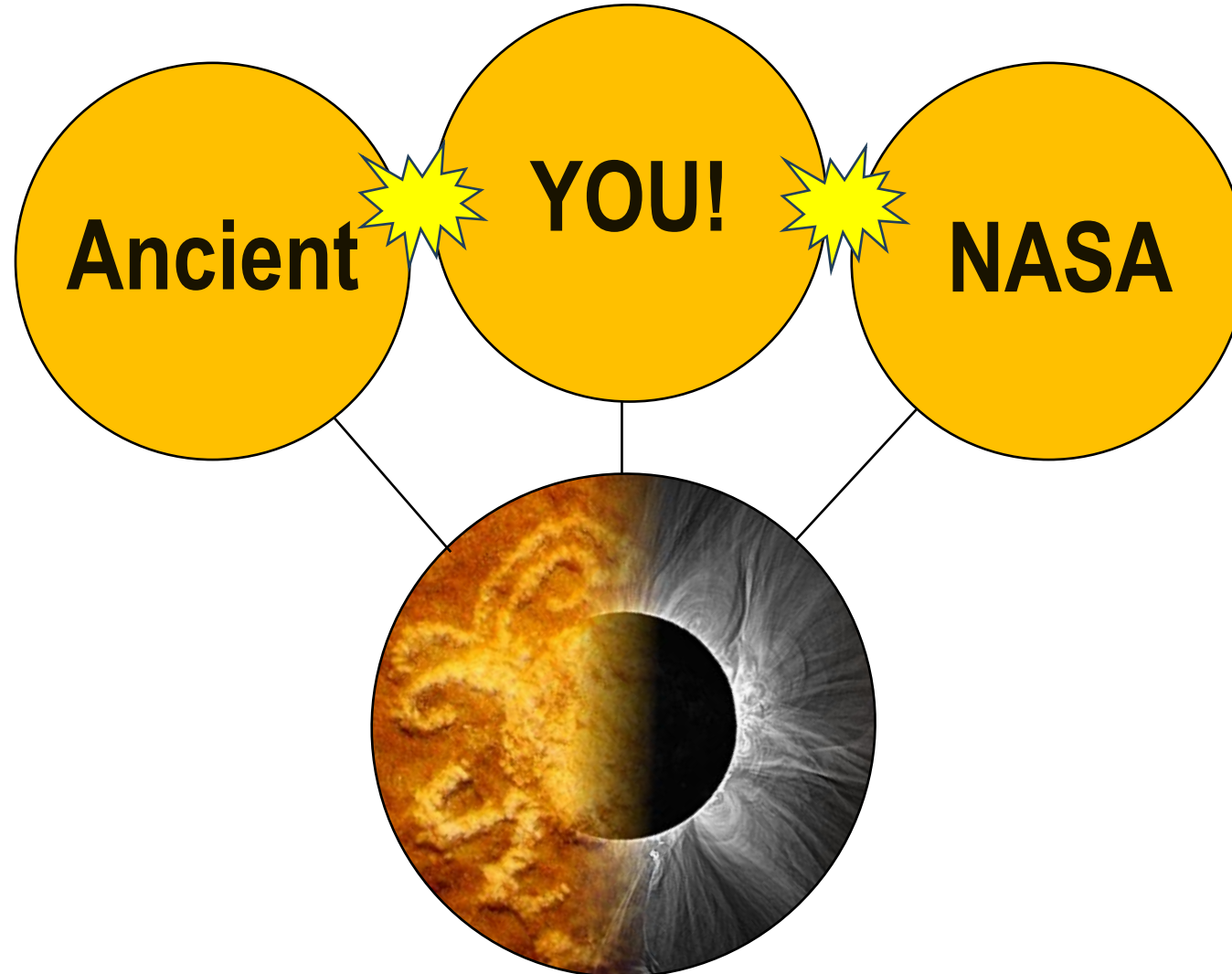


# PUNCH Outreach Theme: Ancient and Modern Sun-Watching





# PUNCH Outreach Theme: Ancient and Modern *Sun-Watching*



# Solar Corona Observers UNITE!

*across time, space, and culture*



**PUNCH:**  
A Mission  
about How the  
Sun Touches Us



# ROCK OF THE SUN IN CHACO CANYON

*"This phenomenal piece, in 5 short minutes, connects modern solar observations to ancient Sun-watching practices in the US Southwest...inviting a shared human experience across the centuries. Well done!"*

Craig DeForest  
Principal Investigator  
NASA PUNCH Mission



## SHOUT-OUTS:

Duke Johnson  
David Meinzer  
Cody Lavery  
Thor Metzinger  
GB Cornucopia  
Jayne Aubele  
Joe Aragon



*Sophie Adams Photography*



*This is an exceptional video,  
and I am sharing it widely!*

Rick Varner  
Center Director  
Scobee Education Center  
San Antonio College





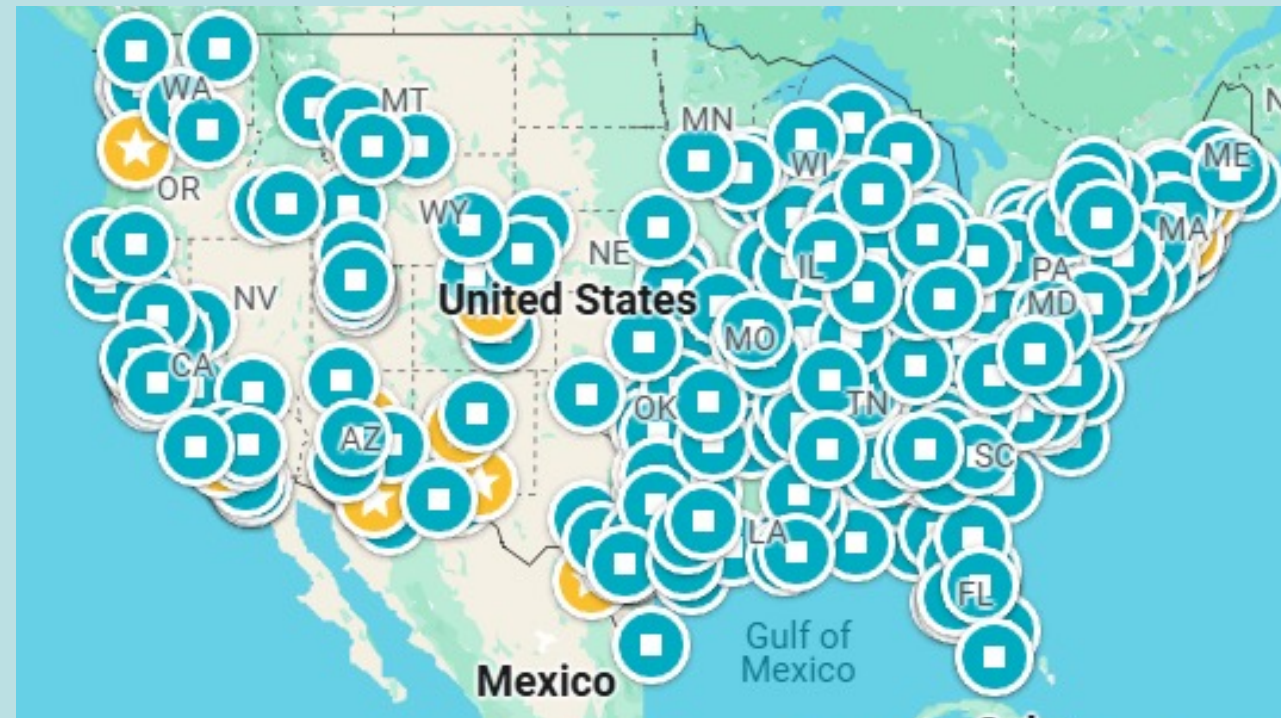




**Partial Eclipse of the Heart?**

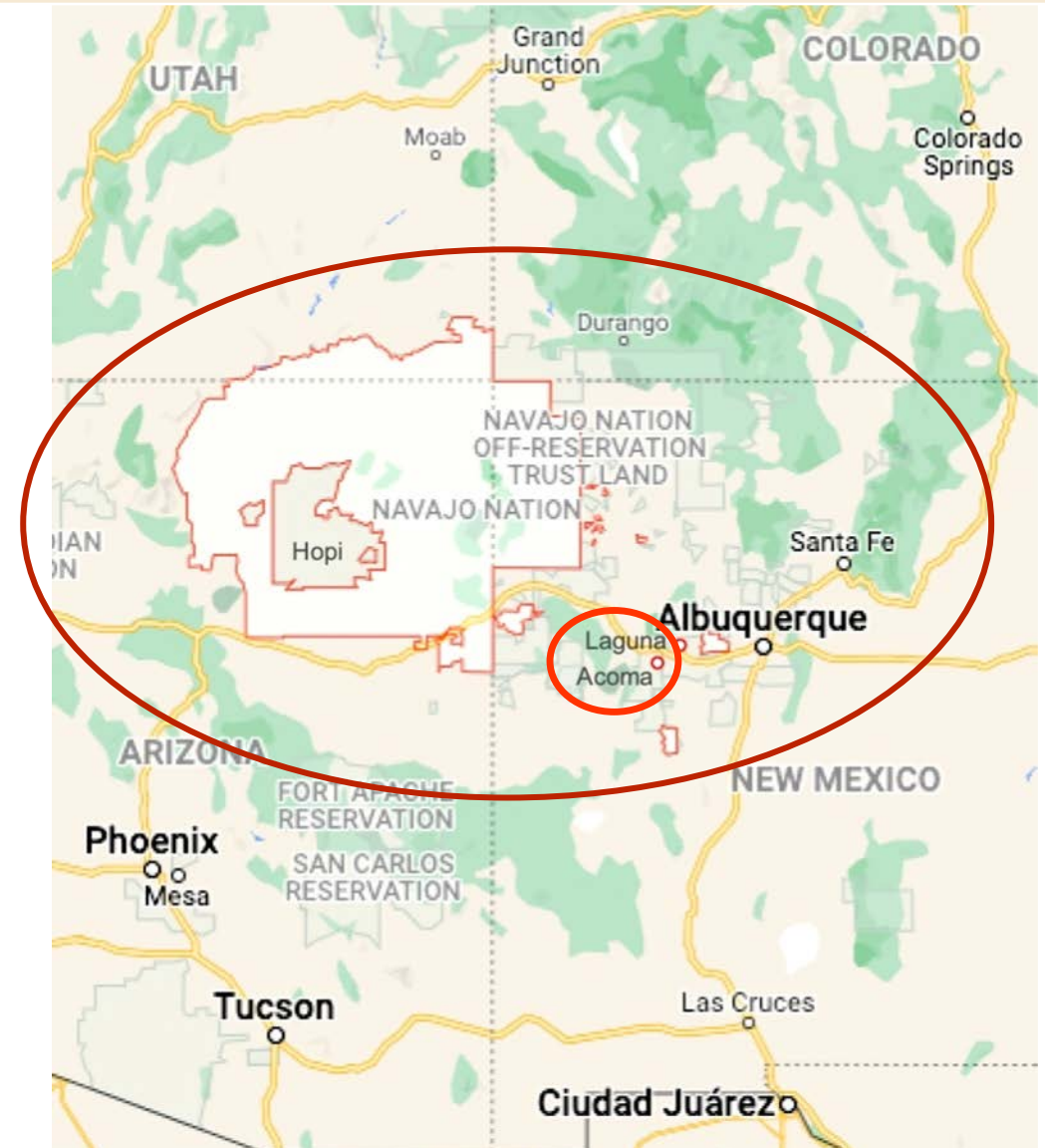
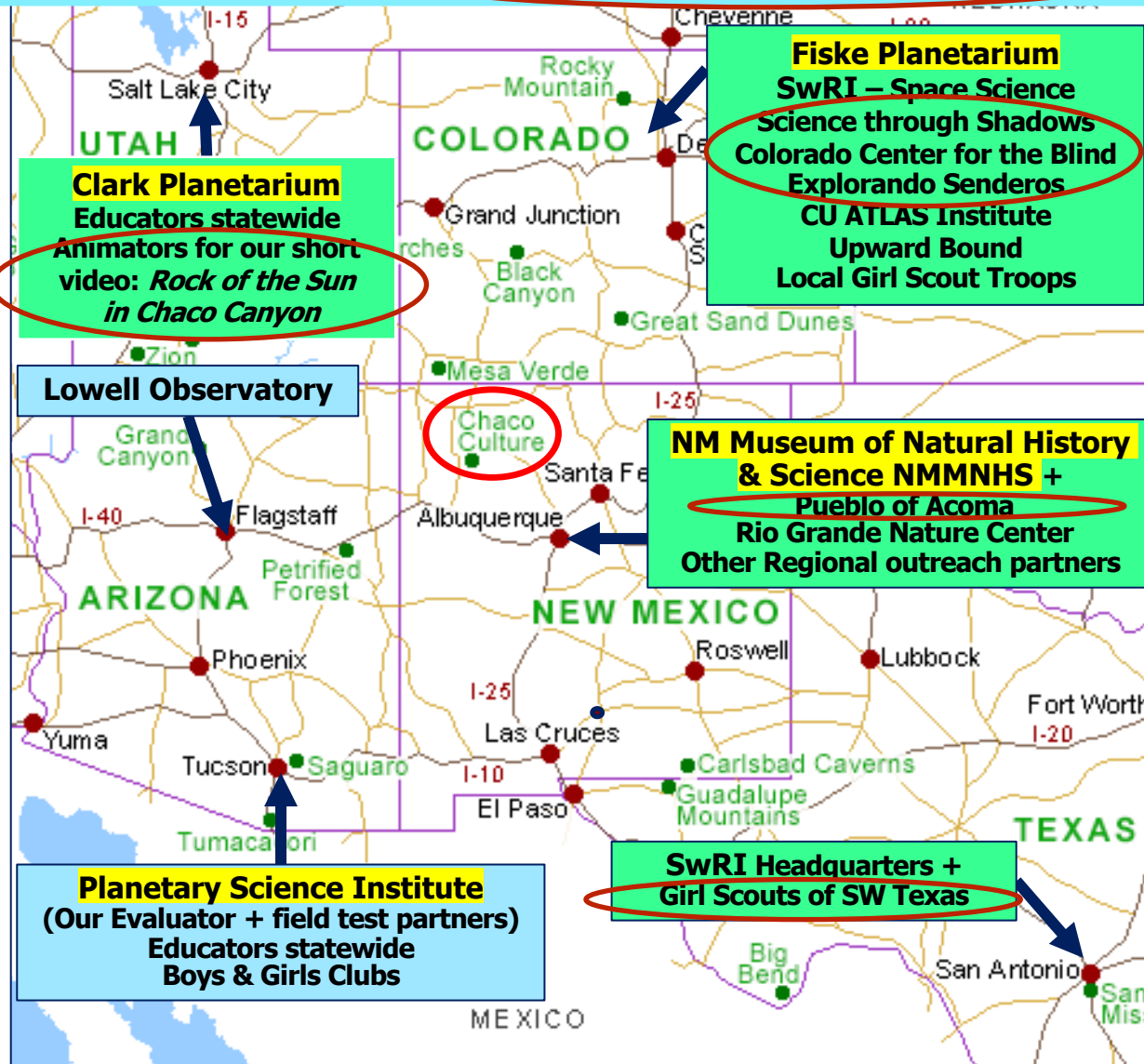


# 3HPPP Dissemination



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 Eclipse Task Force)

**NO “TARGET AUDIENCES”**. We collaborate with historically marginalized populations to develop arts-integrated, multicultural, multisensory products and events of benefit to everyone.





# 2024 PUNCH Outreach Annual Retreat at Center Green 17-18 June in Boulder, Colorado



**SHOUT-OUT:**  
Jason Trump

Our collective *heartfelt thanks* to  
Sarah Gibson & Keri Dawn Solner



Outreach  
for the  
NASA  
PUNCH  
mission

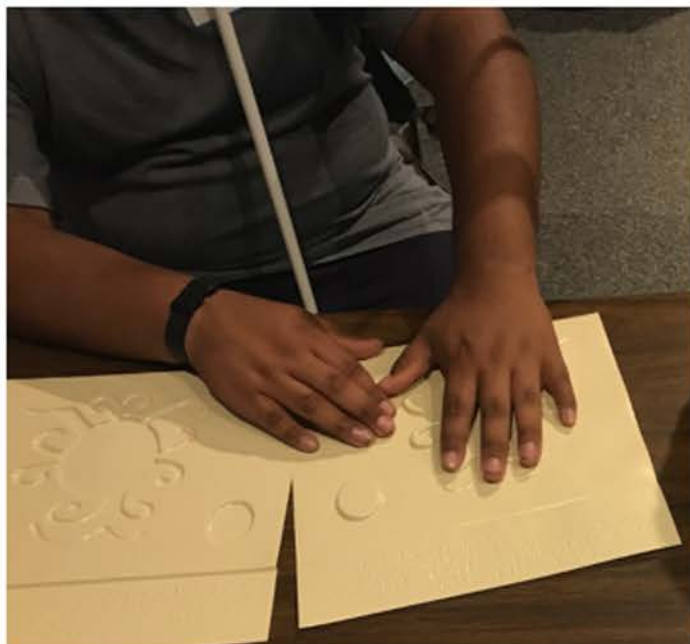
# Populations We are Collaborating With and Learning From



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 Team Cards



<p><b>Tasnim Alshuli</b> Outreach Advisor</p>	<p><b>Joe Aragon</b> Cultural Consultant</p>	<p><b>Jennifer Campbell</b> Mission Planner</p>	<p><b>Sarah Gibson</b> Project Scientist</p>	<p><b>Gilly Gilbert</b> Associate Investigator</p>	<p><b>Lika Guhathakurta</b> Program Scientist</p>
<p><b>Robin Colaninno</b> Instrument Lead</p>	<p><b>Craig DeForest</b> Principal Investigator</p>	<p><b>Heather Elliott</b> Co-Investigator</p>	<p><b>Mary Hanson</b> Test Engineer</p>	<p><b>Denise Hill</b> Communications Lead</p>	<p><b>Briana Ingermann</b> Outreach Program Manager</p>
<p><b>Ronnie Killough</b> Project Manager</p>	<p><b>Don Kolinski</b> Web Developer</p>	<p><b>Florine Lehtinen</b> Financial Analyst</p>	<p><b>Cherilynn Morrow</b> Outreach Director</p>	<p><b>Lisa Vasquez</b> Sr. Admin. Coordinator</p>	<p><b>Nicki Viall</b> Mission Scientist</p>



# Girl Scout Ancient & Modern Sun-Watching Patch

TOPIC 5 of 8:

Meeting the Team of a NASA Sun-Watching Mission

Hundreds of people work together to make a NASA space science mission successful. Get to know some of the professional Sun-watchers of the PUNCH mission!



The three Team Cards above represent scientific leaders for the PUNCH mission to study the Sun. Compared to other NASA missions, PUNCH has a high percentage of women on the science team.



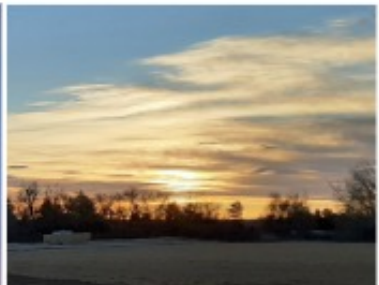
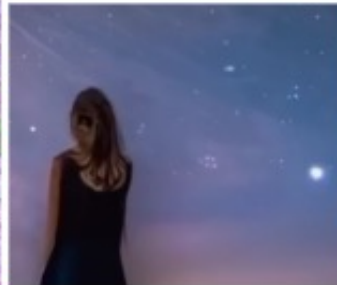


# Girl Scout Ancient & Modern Sun-Watching Patch: Elaborated outline for *Council's Own Patch* submitted to the *Girls of Southwest Texas Council* for review on 14 June

**NEW!**

TOPIC 2 of 8:

Become a Sun-watcher with all your Senses  
Sun-"watching" with *all* of your senses can inspire you  
to learn science, create art, and enjoy life!





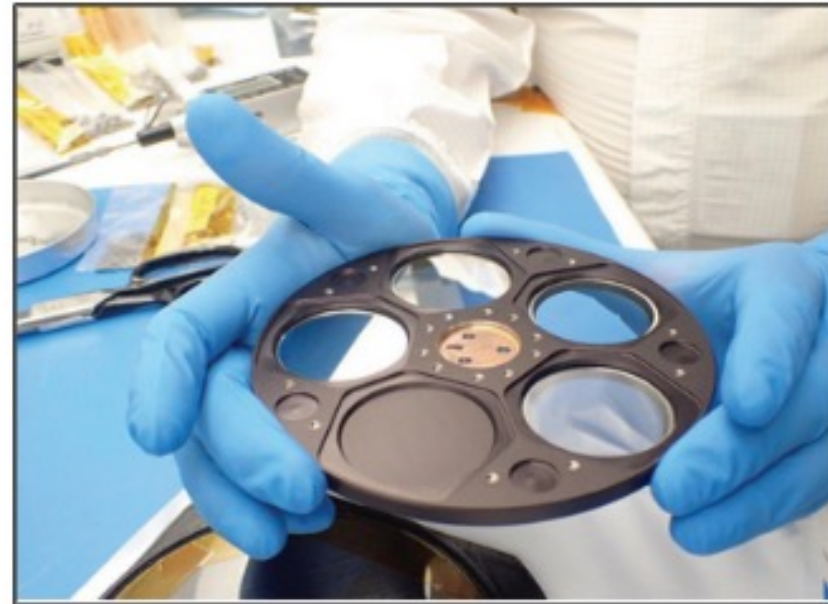
**NEW!**

# Girl Scout Ancient & Modern Sun-Watching Patch

TOPIC 6 of 8:

How are Polarized Sunglasses like a NASA Sun-Watching Mission?

By rotating polarized sunglasses you can become like the polarization wheel on a NASA mission and detect polarized light in your everyday environments.



# Girl Scout Ancient & Modern Sun-Watching Patch

## Making Sense of Your Patch Design

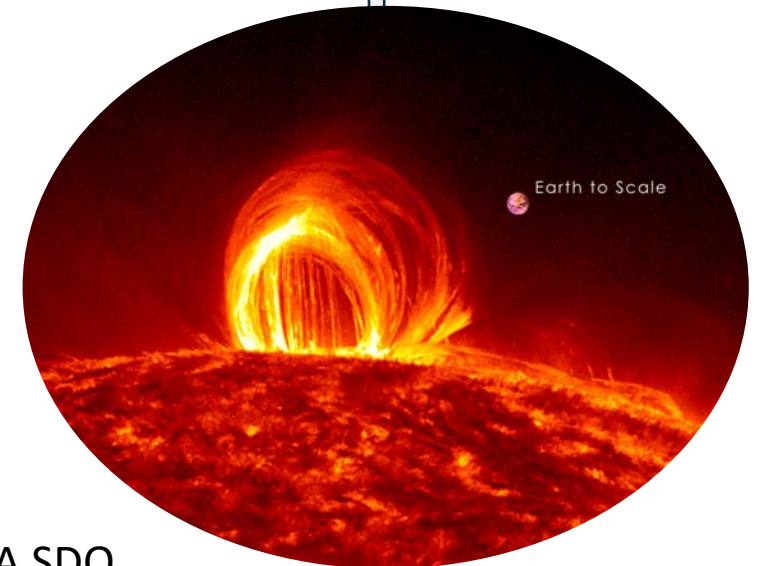


Petroglyph of “stormy” solar corona during the 1097 total solar eclipse?



**TOPIC 4 of 8:**  
Making Sense of Your Patch Design:  
Loops and Storms on the Sun

Coronal Loops



NASA SDO  
19 July 2012

**TOPIC 3 of 8:**  
Making Sense of Your Patch Design:  
An Ancient Rock Carving



# SHOUT-OUTS:

Anny Malanushenko  
Dave Dooling



9news.com

0:22

what is that we're looking at

0:23 / 1:59

9NEWS

The video player shows a woman with blonde hair speaking in a small window. The main video area displays a coronal loop. The player includes standard controls like play, pause, volume, and a progress bar.

Study finds coronal loops may be an optical illusion

# Girl Scout Partner Patch-Earning Event - February 2024



## SHOUT-OUTS:

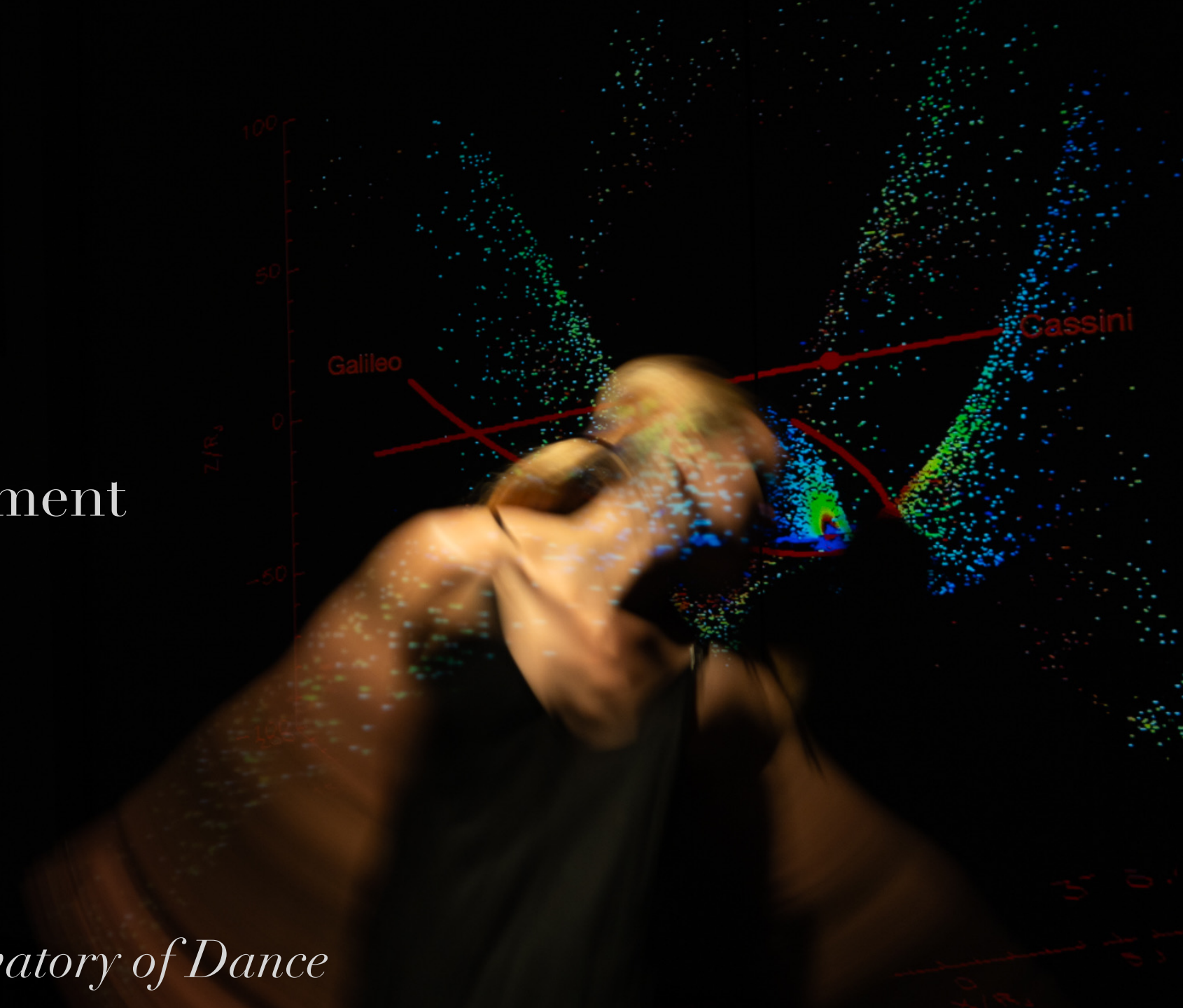
- Mike Zawaski
- Nina Byers
- Rachel Vara
- Heather Elliott
- Girl Scouts of SW Texas



Heliophysics  
A Physical Embodiment

Alexandra Lockhart  
Dancer + Choreographer

*SUNY Purchase Conservatory of Dance*





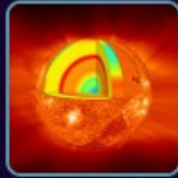
## SHOUT-OUTS:

Don Kolinski (web developer)  
Mike Zawaski & Stacy Wolff  
PUNCH Scientific Leadership

- Craig DeForest
- Sarah Gibson
- Nicki Viall

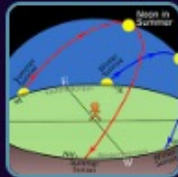


# PUNCH DRAG-AND-DROP FILL-IN-THE-BLANK GAMES



## #1. WHERE is the SUN? HOW BIG? HOW FAR?

The Sun, Earth, and planets are very far from other stars in the galaxy.  
Challenge Level: Medium. Word count: 371. # Blanks: 20. Prerequisites: none.



## #2. WHAT is a DAY? WHAT is a YEAR?

Earth spins one time around to make one day. Each time you have a birthday you have completed one more trip (orbit) around the Sun.

Challenge Level: Medium. Word count: 273. # Blanks: 17. Prerequisites: #1.



## #3. The SUN and LIFE

The Sun's light helps to make our food. Energy from the Sun is essential to life on Earth.  
Challenge Level: Low. Word count: 116. # Blanks: 9. Prerequisites: none.



## #4. SOLAR WIND and the HELIOSPHERE

Every second tons of material speeds away from the Sun in all directions. This so-called "solar wind" creates a "bubble" in space we call the heliosphere.

Challenge Level: High. Word count: 386. # Blanks: 16. Prerequisites: #1.



## #5. SOLAR STORMS and SUNSPOT CYCLES

Solar storms often start in regions where there are sunspots. There is a maximum in the size and number of sunspots every 11 years.

Challenge Level: High. Word count: 378. # Blanks: 18. Prerequisites: #1, #2, & #4.



## #6. The NASA PUNCH MISSION

The NASA PUNCH Mission studies how the Sun's corona expands to become the "solar wind" and tracks how solar storms change as they travel between the Sun and Earth.

Challenge Level: High. Word count: 336. # Blanks: 15. Prerequisites: #1, #4, & #5.



# AAPT Conference July 2023

## SHOUT-OUTS:

- Mike Zawaski





# AstroNote Column in The Physics Teacher March 2024 Issue



## AstroNotes

Column Editors:  
Donald A. Smith, Guilford College, Greensboro, NC; tptastronotes@gmail.com  
Janelle M. Bailey, Temple University, Philadelphia, PA

### NASA PUNCH Outreach products celebrate diverse views of our sun, eclipsed or not

**Cherilynn Morrow**, Public Engagement Director for the NASA PUNCH Mission; cherilynn.morrow@gmail.com

The outreach team embedded in the NASA PUNCH mission<sup>1</sup> has developed a well-vetted suite of Sun-related STEM learning activities<sup>2</sup> to prepare for the 2023 and 2024 solar eclipses and beyond. All activities align with our *Ancient and Modern Sun-watching* theme and thus are of *enduring* value for physics and astronomy teaching beyond the eclipses.

PUNCH (Polarimeter to UNify the Corona and Heliosphere) is a NASA Small Explorer scheduled for launch in 2025. It is designed to image and track solar storms from the outer corona to Earth orbit with unprecedented quality and continuity. Just as our Sun-watching ancestors learned to predict and live well with the seasonal cycles, PUNCH is among the NASA Sun-watching missions helping our technological society learn to live well with the Sun's 11-year activity cycle.

The PUNCH Outreach team creates products in collaboration with mission team members, a consortium of planetariums and science centers in the Four-Corners states (Colorado, New Mexico, Utah, and Arizona), Native American youth and families, Spanish translators, blind learners, and Girl Scouts. Together, we make arts-integrated, multicultural, multisensory STEM activities that are adaptable for all.

One of our signature products is the 3-Hole-PUNCH Pinhole Projector (Fig. 1). In this context, "pinhole" means a lensless hole of any shape that is large enough for sunlight streaming through to be seen on a projec-



Fig. 1. Our 3-Hole-PUNCH Pinhole Projector (left) reveals the "ring of light" (right) during the October 2023 annular eclipse viewed from Chaco Canyon. The Projector is available in both English and Spanish.

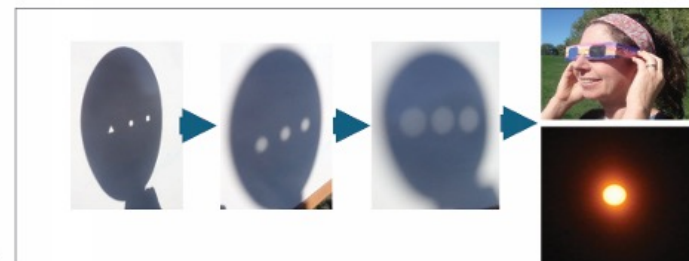


Fig. 2. The three "aha" transitions.

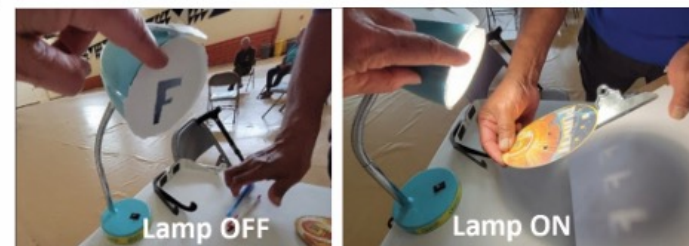


Fig. 3. Tabletop demo. Note the inverted "F" images.



# AGU Conference December 2023



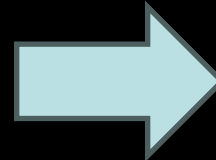


# We have learned so much!

## Thermoform Tactile-Art Representations of the Solar Corona

### SHOUT-OUTS:

Nicole Johnson  
John Keller  
Tasnim Alshuli  
Vivian White (ASP)



# AAS Conference January 2024



## SHOUT-OUTS:

- Jason Trump
- Sanlyn Buxner
- Kenner Planetarium
- AAS members who participated in a new model for supporting scientists' outreach



# Bulletin of the American Astronomical Society - March 2024

baas.aas.org/pub/2024i3n033/release/3

**BAAS**  
BULLETIN OF THE AAS

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📖 Celebrating the Wonder of Science in the S ... 2 more Published on Mar 19, 2024 DOI 10.3847/25c2feb.25cd07d9 SHOW DETAILS

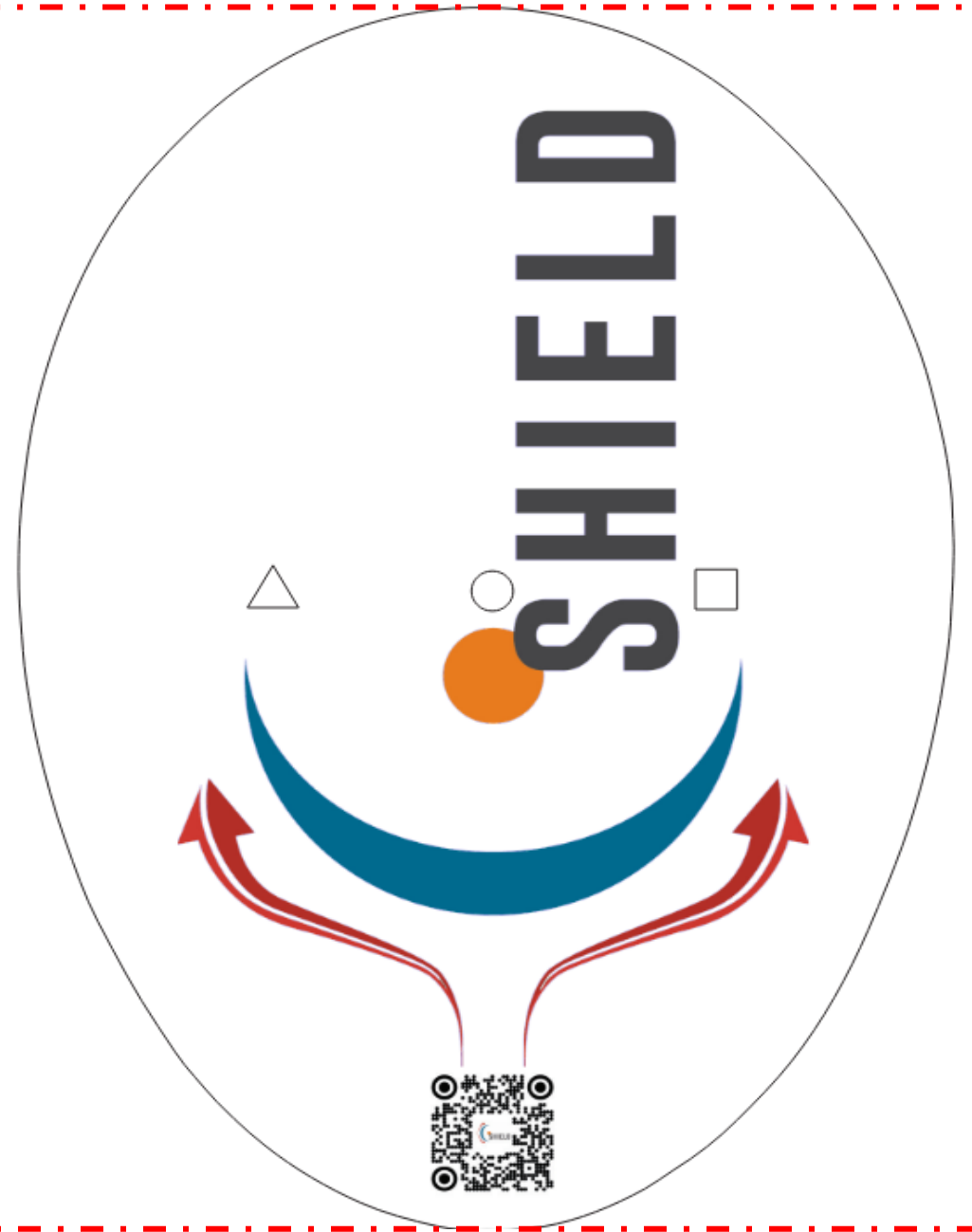
## NASA PUNCH Outreach Creates Learning Activities that Celebrate Diverse Views of Our Sun, Eclipsed or Not

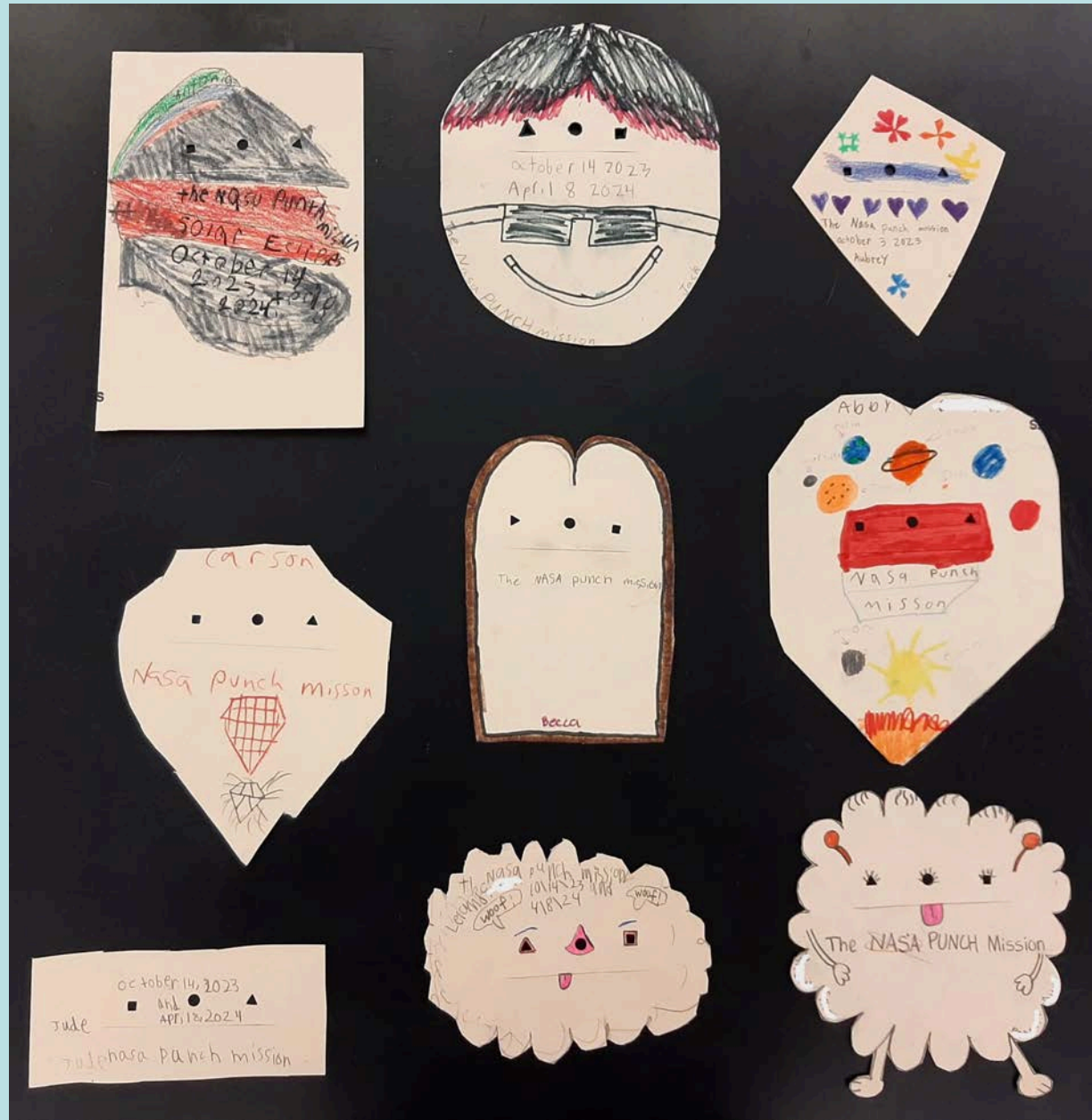
CITE [ # ]  
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CONTENTS [ ]

An “eclipse” petroglyph in Chaco Canyon and the 3-Hole-PUNCH pinhole projector are featured among the enduring learning activities developed by the NASA PUNCH Public Engagement Team for use with the 2024 eclipse and beyond.

*by Cherilynn Morrow and NASA PUNCH Public Engagement Team*

🕒 last released 3 months ago





1



**NASA PUNCH Outreach**  
Ancient & Modern Sun-Watching

NASA's PUNCH mission will launch in 2025. PUNCH will use polarized light to study the science of "space weather" and to track solar storms better than ever before!

PUNCH Outreach invites **you** to commune across time, space, and culture with our Sun-watching ancestors and with our NASA Sun-watching missions.

Visit [tinyurl.com/PUNCHOutreach](https://tinyurl.com/PUNCHOutreach) for PUNCH Outreach products and to learn more about NASA's PUNCH mission.







2



Image: Photograph of the Sun taken by NASA's Solar Dynamics Observatory

**Become a Sunwatcher**

With the help of scientists, Native American and Spanish-speaking youth and families, Blind & Low-Vision learners, and Girl Scouts, we've created activities that empower **you** to find a deeper connection with the Sun. We all have ancestors who were sunwatchers. NASA exploration is a natural extension of humanity's age-old practice of observing the Sun's rhythms and mysteries.

Con la ayuda de científicos, jóvenes y familias nativas americanas y de habla hispana, estudiantes ciegos y con baja visión, y Girl Scouts, hemos creado actividades que te permiten encontrar una conexión más profunda con el Sol. Todos tenemos ancestros que observaban el Sol. La exploración de la NASA es una extensión natural de la práctica ancestral de la humanidad de observar los ritmos y misterios del Sol.

**Conviértete en un Observador del Sol**

Image: Petroglyph in Chaco Canyon interpreted as an Ancestral Puebloan impression of the 1977 total solar eclipse



3



**Become a Sun-Watcher**

Explore the connections between Personal Sun-watching, NASA Sun-watching, and Ancient Sun-watching with our Ancient & Modern Sun-Watching activities, developed in close collaboration with people like you.

**Convertirse en un Observador del Sol**

Explora las conexiones entre la observación personal del sol, la observación del sol por parte de la NASA y la observación del sol antigua con nuestras actividades de observación del sol antiguas y modernas, desarrolladas en estrecha colaboración con personas como tú.









Outreach  
for the  
NASA  
PUNCH  
mission

## Receive our monthly 1-page newsletter

- Provides updates on our latest activities and outreach product releases.
- Invites you to contribute photos and ideas for our "Did You Know" and "Your Solar Photo of the Month" sections.
- Email us with other ideas to consider



[https://punch.space.swri.edu/punch\\_outreach\\_products.php](https://punch.space.swri.edu/punch_outreach_products.php)

**PUNCH Public Engagement**  
Monthly Newsletter Issue 8: June 2023  
Shining New Light on Diverse Views of the Sun with our Ancient & Modern Sun-Watching Theme

**Did You Know....**  
...that the science of solar physics extends back to ancient Babylonia? Cuneiform records of solar eclipses date back as far as 1375 BCE, so we know that observations of the corona pre-date the Roman republic by nearly a thousand years.

**Helping Colleagues to Touch Chaco Culture**  
PUNCH Outreach provided a unique 2-day excursion for ~20 astronomers and educators from around the US just prior to the June meeting of the [American Astronomical Society](#). The Day 1 trip to [Chaco Canyon](#) included a multi-sensory tour of Pueblo Bonito, the largest excavated Great House, and a visit to the "eclipse" petroglyph. PUNCH Outreach Director, Cheryl Lynn Morrow, and retired ranger, GB Cornucopia, offered a combined 45 years of experience in interpreting Chaco. They emphasized evidence for the Sun-watching mastery of the [Ancestral Puebloan](#) people and empowered participants to enrich their own eclipse outreach with stories of Chaco.

On Day 2 in Albuquerque, participants engaged with a suite of PUNCH Outreach activities. One was [Seeing the Sun's Corona with Your Hands](#), where learners explore thermoform tactile art representations of the solar corona (pictured below).

Right: Participants can feel how the structure of the corona at solar maximum compares to that at solar minimum.

Left: Chaco's "eclipse" petroglyph in thermoform tactile art. Other tactiles include NASA & [HAQ images](#).

**Showcasing Girl Scout Prototype Patch Activities at the US Planetarium Conference**  
PUNCH Outreach convened an interactive workshop at the US Planetarium Conference (June 23) that generated excitement for our *Ancient & Modern Sun-Watching* Girl Scout patch. After experiencing a selection of the patch activities, planetarium professionals engaged in a documented discussion about what to include in our Event Planning Guide to support them in providing Girl Scout patch-earning events. Find our current [activities and facilitator guides on the PUNCH Outreach Products webpage](#). Our Mark 2 Prototype Girl Scout Patch & Event Planning Guide are combining these and other activities that are unique to Girl Scout needs and values.

**Your Solar Photo of the Month**  
Every month we feature a photo [submitted by readers](#) that portrays a personal experience of the Sun.

This is my back patio in Albuquerque with the early afternoon sunlight filtering through the [latillas](#) in the roof. I love to sit here when this particular Sun pattern appears and I am surrounded by it. It looks like an artist's brush strokes but made with light rather than paint!

Visit [punch.space.swri.edu](https://punch.space.swri.edu) for more about the NASA PUNCH mission and its Outreach program. For questions or photo submissions: Outreach Deputy Program Manager ([trump@slco.org](mailto:trump@slco.org)) & Outreach Director ([cherilynn.morrow@gmail.com](mailto:cherilynn.morrow@gmail.com)). [View the Newsletter Archive](#).