

Polarimeter to UNify the Corona and Heliosphere (PUNCH)

Proposed companion acronym: People Unifying Naturally with their Cosmic Home



PUNCH Outreach Update Celebrating Mission Team Contributions for PUNCH 6



California State Polytechnic University
San Luis Obispo, CA
25 February 2025





500+ students at Two School Assemblies PINE GROVE ELEMENTARY SCHOOL, SANTA MARIA, CA



PUNCH Outreach contributed to two NASA Launch Services assemblies, providing a talk about PUNCH and outreach materials to over 500 students and teachers at Pine Grove Elementary (Santa Maria, CA - 20 Feb 2025).



Important PUNCH Team People Dancing Up a Solar Storm



The public debut of our *Dancing Up a Solar Storm* video-guided art-science activity was a great hit with everyone assembled as part of our primary pre-launch public outreach event at the California State Polytechnic University in San Luis Obispo, CA (23 Feb 2025).



Local TV news media covered the event. PUNCH Outreach is supporting a dozen other pre-launch events. We are reaching thousands of people with PUNCH team members and/or high-quality outreach products



Our 3-Hole-PUNCH Pinhole Projector Delights Learners with and without an Eclipse

Our proven 3-hole design makes the Projector timelessly relevant to science education, both outdoors and indoors!

No eclipse necessary
ANY day the Sun shines



2024 Partial Phase of a Total
Eclipse Kentucky Science Center



2023 Annular Eclipse
Chaco Canyon, NM

WHAT is HAPPENING? When the Projector is held close to the surface, we see triangle, round, and square shapes of light that match the shapes of the Projector's holes. As we pull the Projector farther away from the surface, we see images of the round or eclipsed Sun forming on the surface.



Use of our 3-Hole-PUNCH Projector has Spread Joy & Delight Across the Nation



3-Hole PUNCH Pinhole Projector

DO NOT use this card to look directly at the Sun!

1. Facing away from the Sun, hold this card so that the Sun's rays pass directly through the holes onto a smooth surface like a wall or sidewalk (depending on the Sun's height). Move the card closer until you see a triangular, a round, and a square shape of light on the surface.
2. Observe the shapes of light as you slowly move the card farther from the surface. When all three shapes change to round, each hole is forming an image of the round Sun! Making images using only a small hole is called "pinhole projection."
3. Repeat steps 1 and 2 during a solar eclipse to see inverted images of the Moon partly blocking the Sun!
4. Small gaps between plant leaves can also form "pinhole images" of the Sun. Look for round shapes of light among the shadows!

Visit the link on the other side to learn more!

- Disseminated **more than 350,000** [3-Hole-PUNCH Pinhole Projectors](#) for 2023 and 2024 eclipse events.
- Educators in EVERY state
- Photos and reports revealed the **joy and delight** experienced by both facilitators and event participants of **all ages**.





3-Hole-PUNCH Pinhole Projector

Joy and Delight for all Ages. Indoors and Outdoors

No eclipse necessary
ANY day the Sun shines...





Spreading Joy and Delight with our 3-Hole-PUNCH Pinhole Projector



**On a beach
(Maine)**



**In the street
(Kentucky)**



**On a tarp
(Mazatlan)**



**In the park
(Texas)**





Our Projector Excites Curiosity: *From 4-Year Olds to Physicists*



NASA PUNCH Mission Scientist, Dr. Nicki Viall, with TV meteorologist, Al Roker, following live coverage of the eclipse in New York City for NBC's *Today Show*.



Small Gaps among Leaves are Like the Small Holes of our Projector

We can find “pinhole images” of the round Sun all around us. These are REAL images of the actual Sun – our star!



We can find solar images at all times of the day and year amid the shadows of trees with leaves or needles. We find them on sidewalks, on snow, on fences, and buildings. On sunny days, do a scavenger hunt to find them!



NASA Mission Scientist, Dr. Nicki Viall on the Today Show





Giving a public science talk for the Benitez Public Outreach Event



Dr Nicki Viall, NASA Mission Scientist for the PUNCH Mission giving a public science talk about eclipses at our premier public outreach event on the Cal Poly campus. (23 Feb 2025)



New Birthday Sunrises Banners

Birthday Sunrises on the Horizon

Great Kiva
Chaco Canyon, NM

Summer Solstice
~June 21

Spring Equinox ~March 21
Fall Equinox ~September 21

Winter Solstice
~December 21

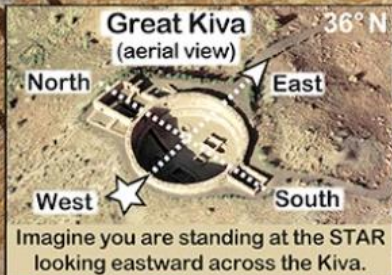
Northeast

East

Southeast



Where on the horizon does the Sun rise on your birthday?



tinyurl.com/PUNCHOutreach



Experimenting with Use of Numbers

Birthday Sunrises on the Horizon

Great Kiva
Chaco Canyon, NM

Summer Solstice
~June 21

Spring Equinox ~March 21
Fall Equinox ~September 21

Winter Solstice
~December 21



Northeast

East

Southeast

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

Which number is nearest to the sunrise on your birthday?



tinyurl.com/PUNCHOutreach



Our 3-Hole-PUNCH Pinhole Projector Creates Images of Ceiling Lights

The Projector's shadow cast on the carpet reveals the ceiling lights are shaped like stars



**PUNCH Project Manager
Ronnie Killough**
Chicago AGU 2022

demos the [3-Hole PUNCH Pinhole Projector](#)
INDOORS at the Adler Planetarium in Chicago.





Our *Indoor* Demo of the 3-Hole-PUNCH Pinhole Projector

A Powerful Learning Companion to Outdoor Demonstrations. NOT just for Rainy Days.

Inexpensive LED Desk Lamp
with 2 masks ready to go



Flip a mask over the light
source to change its shape



All 3 holes of the projector
make an image of that shape on a surface



Enjoy playing with
this in the lobby!





Gilly Gilbert at our AGU 2023 PUNCH Outreach Poster

Seeing With Your Hands

**Enjoy playing with
this in the lobby!**

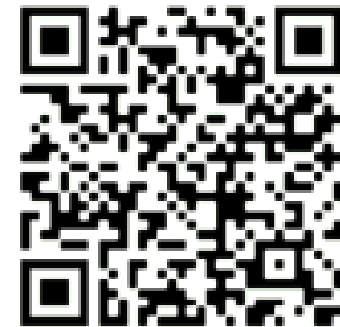




The NASA PUNCH Outreach team presents:

The Delight of Polarized Light

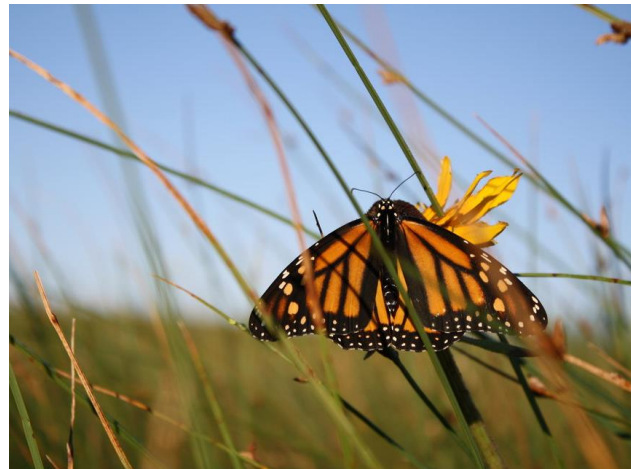
for use by educators and learners of all ages
who are curious to explore NASA and Nature



PUNCH Outreach Products
tinyurl.com/PUNCHOutreach



Polarized Light is All Around Us





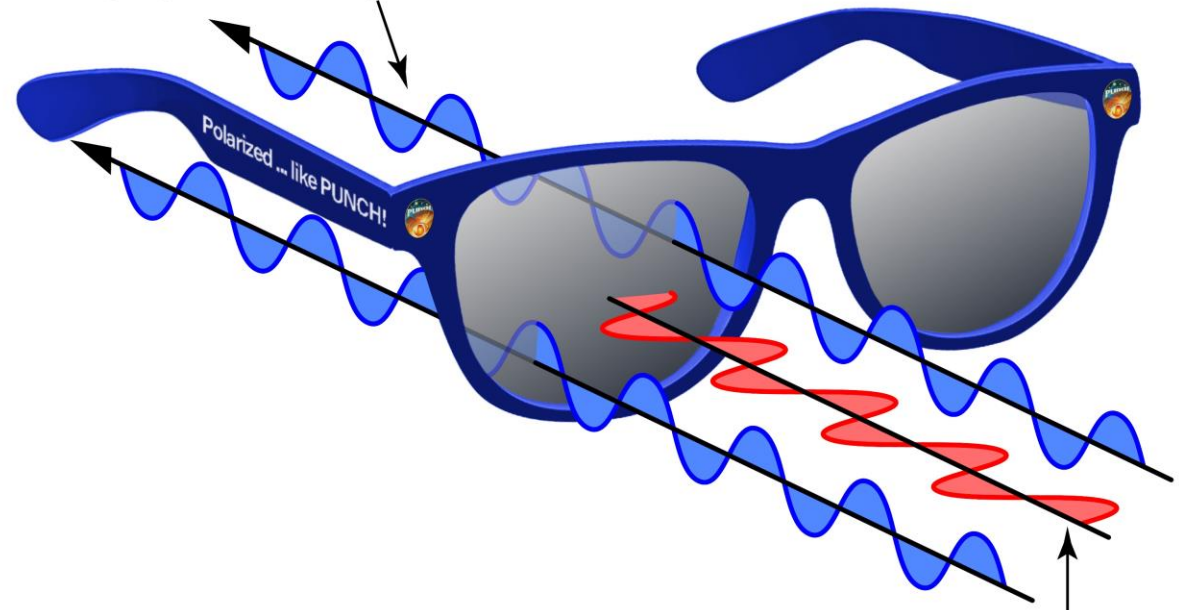
PUNCH Polarizing Sunglasses



One of Craig's two sons

Action of Polarized Sunglasses

Light waves vibrating perpendicular to the bridge pass through



Light waves vibrating parallel to the bridge are blocked



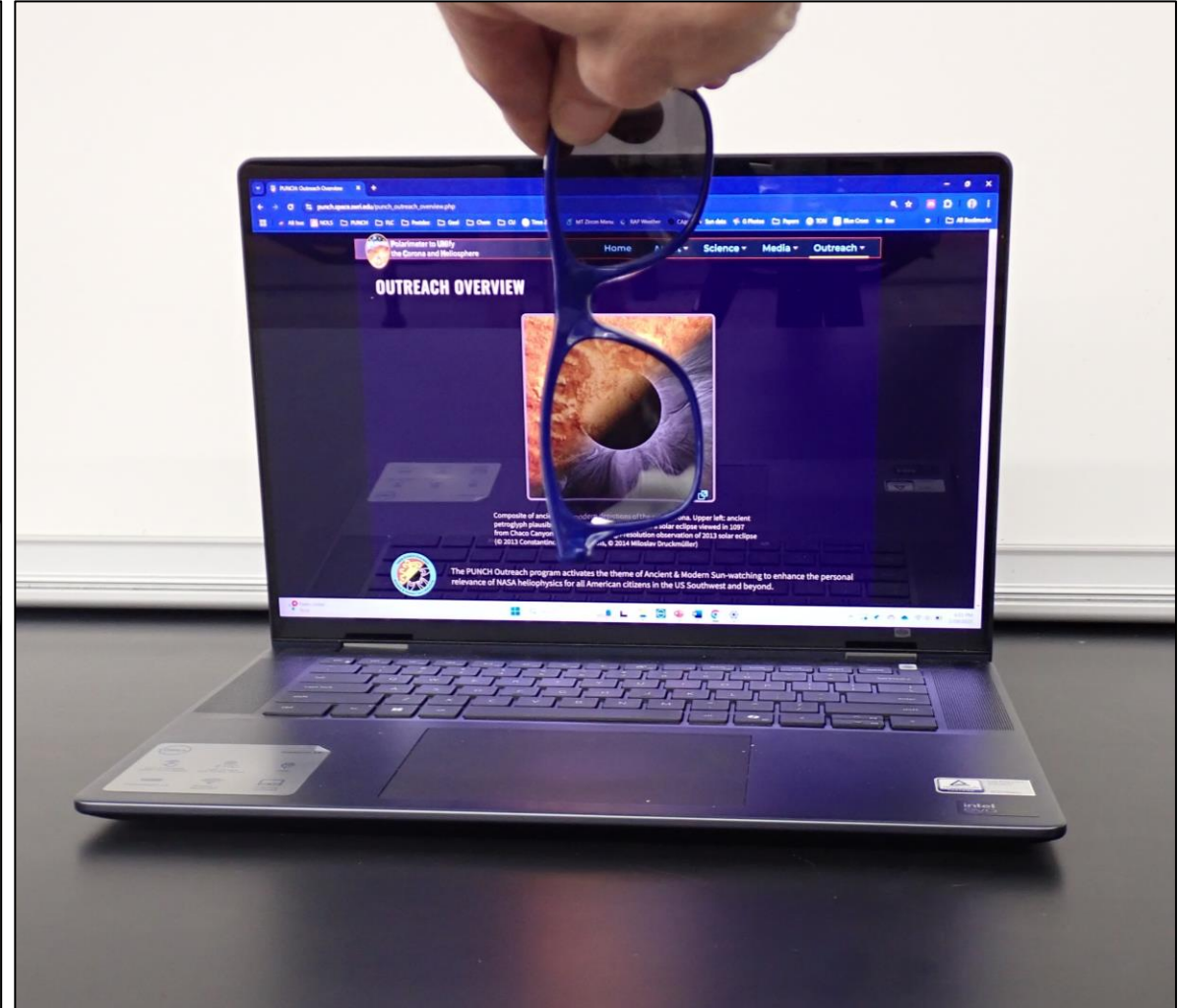
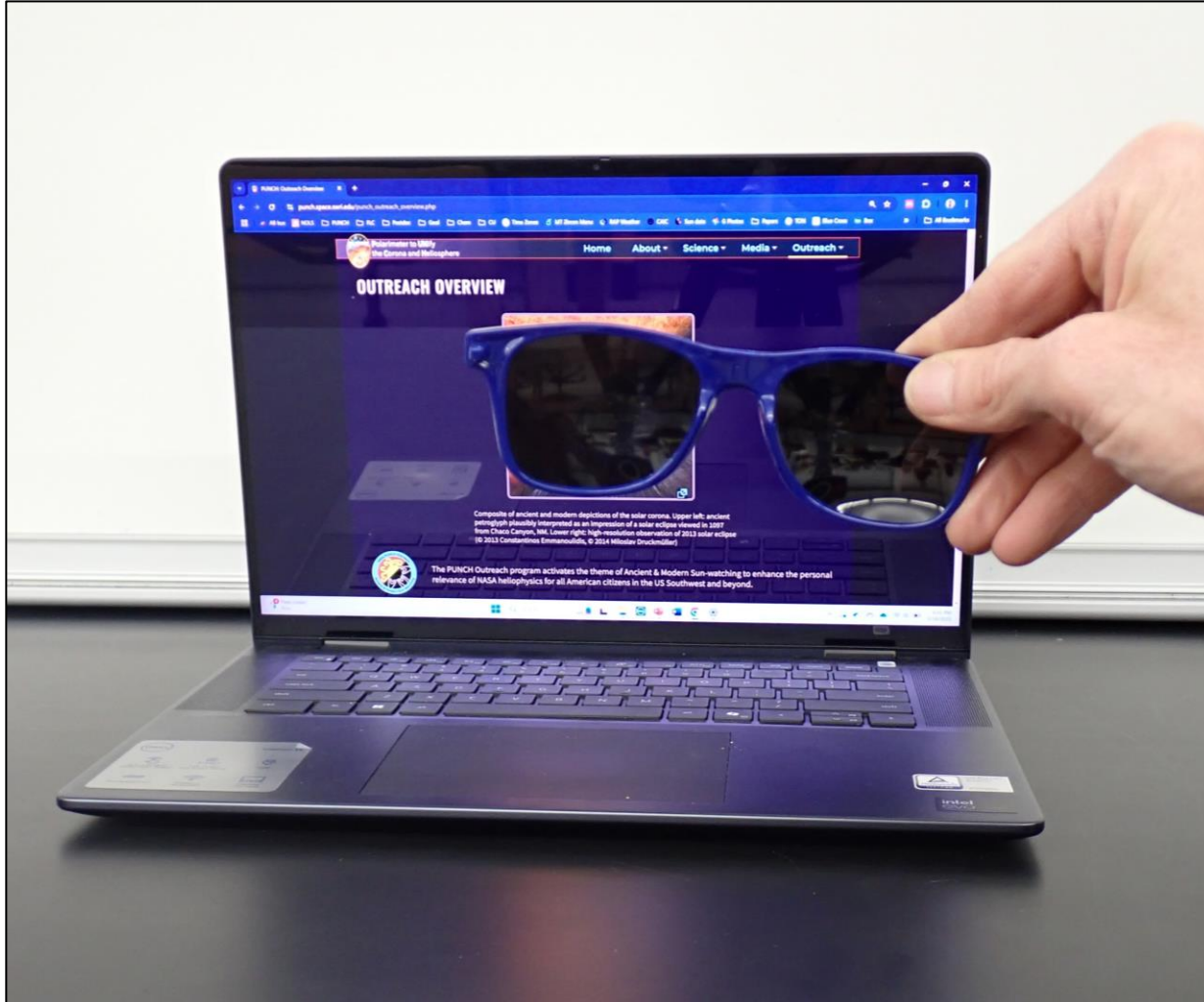
Many Electronic Screens Emit (Give Off) Polarized Light

We can use polarized glasses to test this



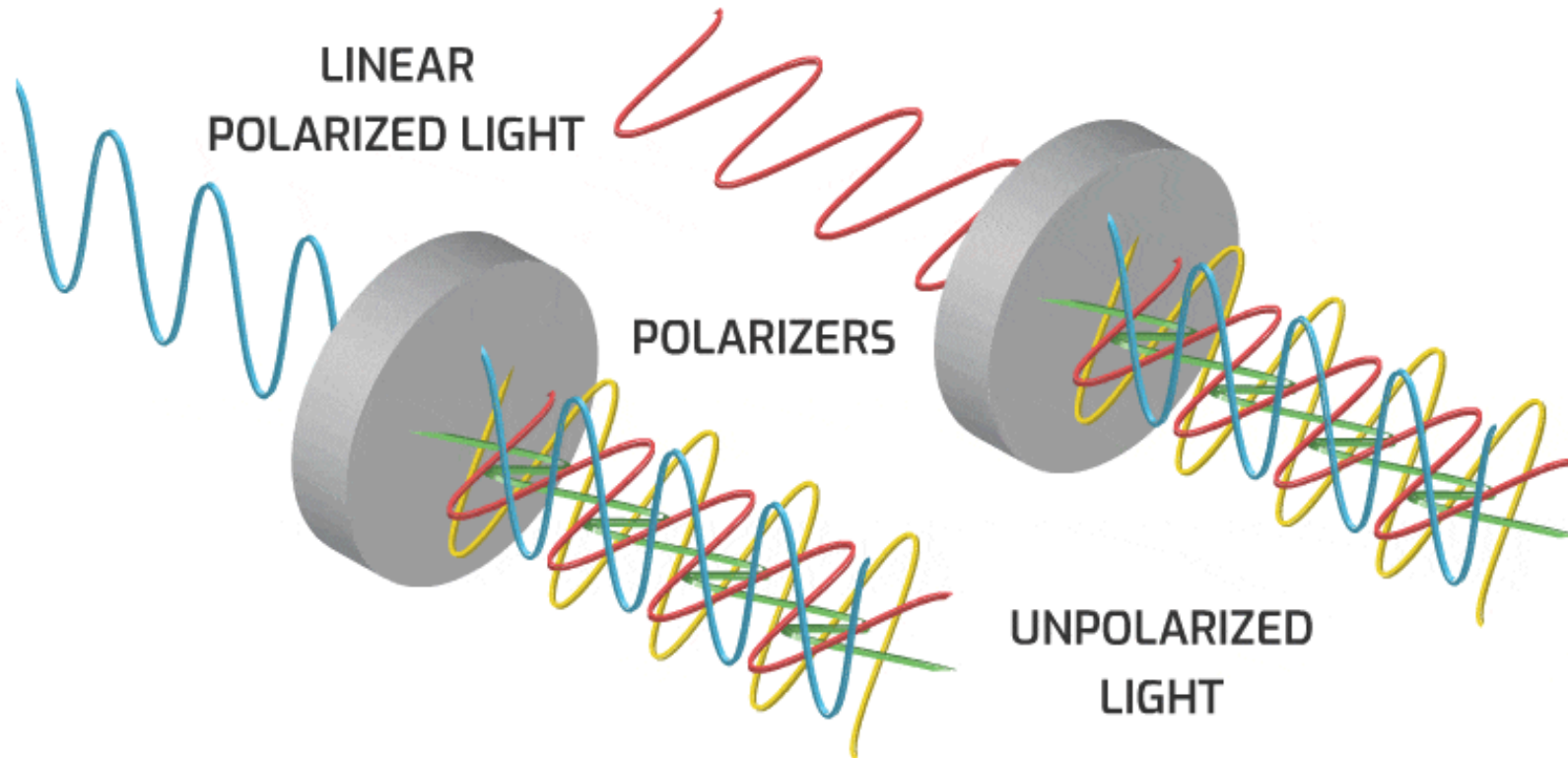


Screen Testing for Polarized Light





What is Polarized Light?

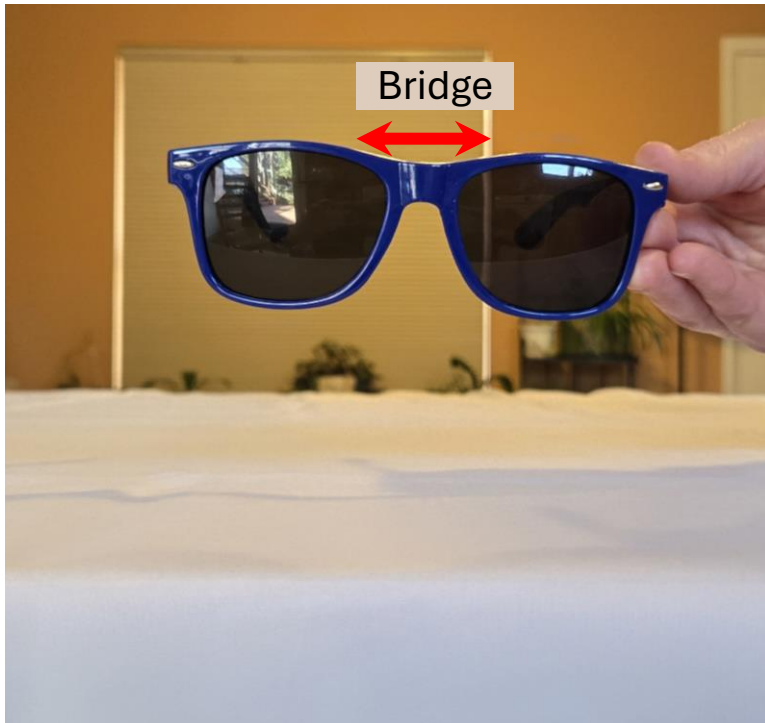




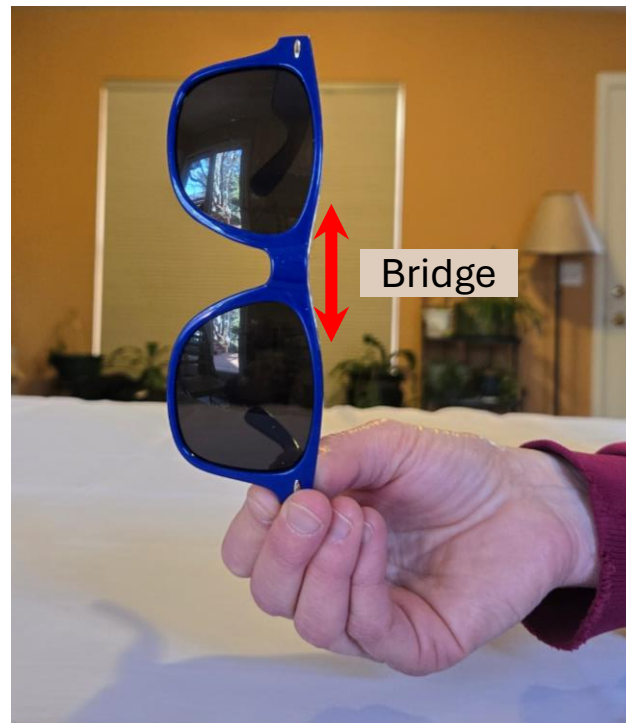
Polarized Sunglasses Block Polarized Light Vibrating in the Direction of the Bridge

When the lenses go black, we have detected light that is vibrating (polarized) along the bridge

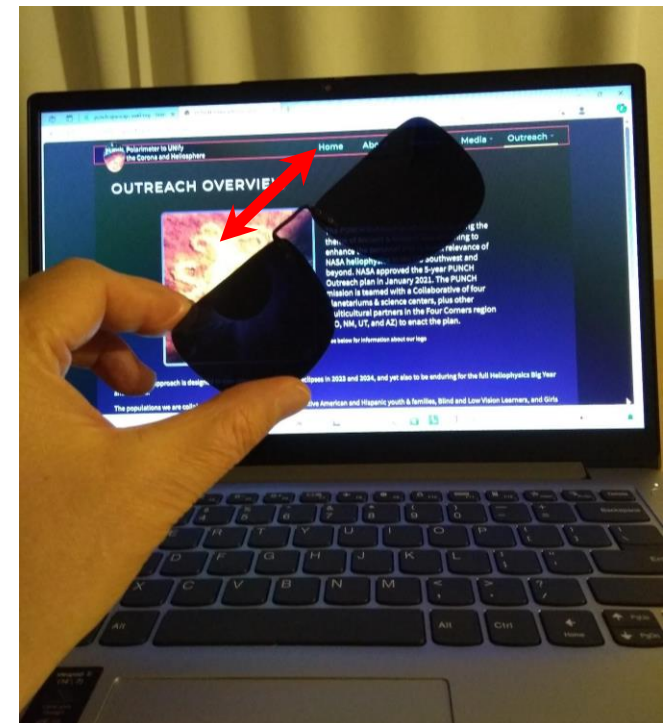
Blocks waves *vibrating side-to-side*



Blocks waves *vibrating up-and-down*



Blocks waves vibrating along bridge





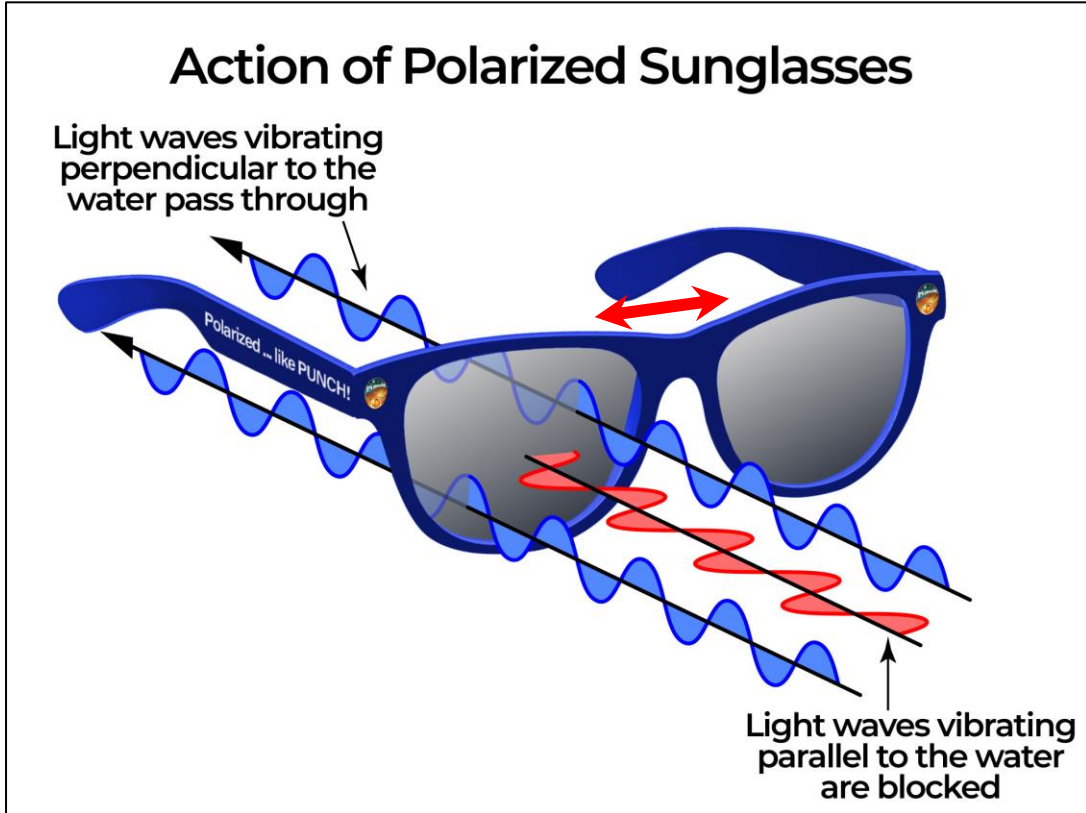
Rotating Polarized Glasses to Detect Polarized Light ...like the PUNCH polarizing filter wheel





The Light of a Rainbow is Polarized along the Direction of the Bow

At the top of the rainbow, the light is polarized side-to-side so polarized glasses held parallel to the ground can block it



But what happens if you look near the sides of the bow?



Parker Team at the Parker-PUNCH Palooza

**FISKE Planetarium
University of Colorado
Boulder, CO
17 December 2024**



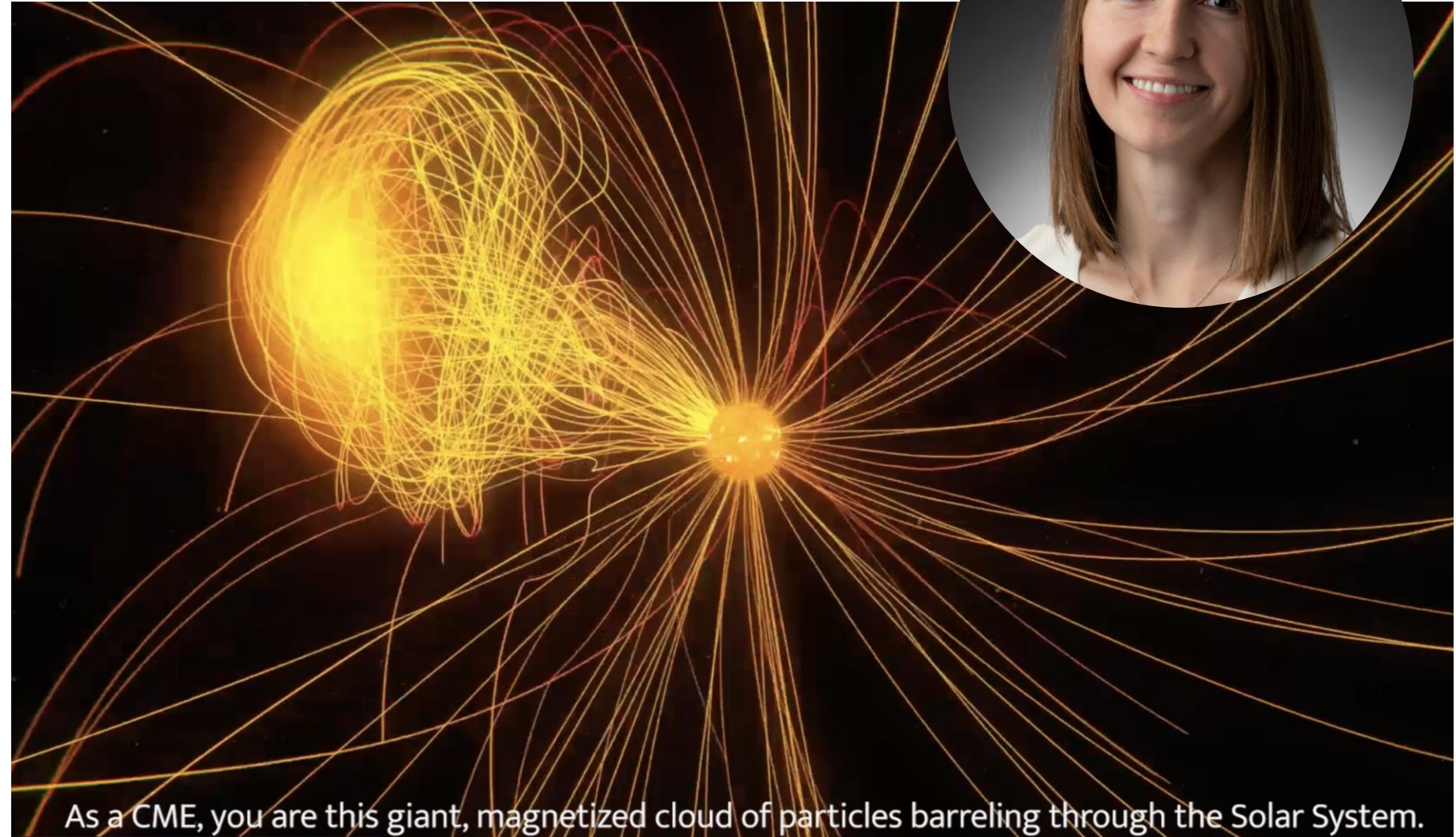


Elena Provornikova



Visualization support for *Dancing Up a Solar Storm* and also for a PUNCH short film being developed by Fiske Planetarium.

New planetarium pipeline established for GAMERA model data!



As a CME, you are this giant, magnetized cloud of particles barreling through the Solar System.



Chris Lowder at the PUNCH-Parker Palooza

Craig DeForest – Tuned in Remotely from CA



**New Mexico Museum of
Natural History & Science
Albuquerque, NM
22 Feb 2025**



Support for Scientists in Outreach

The screenshot shows the NASA PUNCH Outreach website. At the top, there is a navigation bar with links for Home, About, Science, Media, and Outreach. The Outreach dropdown menu is open, showing options: Outreach Overview, Outreach News, What is Heliophysics?, Outreach Team, Support for Scientists (highlighted), Outreach Products, Newsletters, and Publications / Presentations.

OUTREACH PRODUCTS

The well vetted educational products and activities linked below are aligned with the Outreach theme of Ancient & Modern Sun-watching described on our [Outreach Overview](#). May these enduring activities enhance you and your learners' Sun-watching experience, increase your awareness of our common Sun-watching heritage and the natural extension of that heritage into space with NASA Sun-watching [missions like PUNCH](#).

FUN ACTIVITIES to inspire curiosity, wonder, and learning about the Sun

- 3-Hole-PUNCH Pinhole Projector (oval-shaped card 6 inches tall)**
This projector allows safe, indirect viewing of the Sun and is a wonderful tool for the study of image formation. The Projector brought joy and delight to hundreds of thousands of people observing from every state of our country during the 2023 and 2024 eclipses. Yet its 3-hole design makes it timelessly relevant to science education both outdoors in the Sun or indoors with a desk lamp. (Spanish version and a 6-min How-to video available)
- PUNCH Team Cards (digital interactives + printable downloads)**
Experience the beautiful 3-D interactive formatting of our online cards as you meet members of the NASA PUNCH Team. (Physical cards are also available as printable PDF downloads).
- Sun Fun Fill-in-the-Blanks (drag & drop interactive)**
Play an online "drag & drop" word game to learn about the Sun and its effects on Earth.
- Dancing Up A Solar Storm (15-min video-guided activity)**
Deepen your appreciation for the beauty and nature of the Sun and solar storms. This video-guided kinesthetic learning activity for all ages interweaves the art of dance, exciting science, and embodied science education.



Outreach
for the
NASA
PUNCH
mission

Visit our webpage:

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



tinyurl.com/PUNCHOutreach

The screenshot shows the 'OUTREACH PRODUCTS' section of the PUNCH Outreach website. The page has a dark blue background with white and yellow text. At the top, there is a navigation bar with links for Home, About, Science, Media, and Outreach. Below the navigation bar is the PUNCH Outreach logo, which is a circular emblem with a stylized sun and the text 'NASA PUNCH Outreach Ancient & Modern Sun-Watching'. The main content area is titled 'OUTREACH PRODUCTS' and contains a paragraph of introductory text. Below this, there is a section titled 'FUN ACTIVITIES to inspire curiosity, wonder, and learning about the Sun'. This section lists several activities, each with a small thumbnail image and a brief description:

- 3-Hole-PUNCH Pinhole Projector** (oval-shaped card 6 inches tall): This projector allows safe, indirect viewing of the Sun and is a wonderful tool for the study of image formation. The Projector brought joy and delight to hundreds of thousands of people observing from every state of our nation during the 2023 and 2024 eclipses. Yet its 3-hole design makes it timeless relevant to science education both outdoors in the Sun or indoors with a desk lamp. (Spanish version and a 6-min How-to video available)
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- Rock of the Sun in Chaco Canyon** (5-min video): View a short video that introduces an unusual, curlicue petroglyph (rock carving) located in Chaco Canyon, New Mexico at a Sun-watching site we call Rock of the Sun. The petroglyph might be humanity's first known representation of a solar storm in the corona.
- The Petroglyph Inquiry for Blind, Low-Vision, and Sighted Learners**: Use a set of visuals and/or corresponding tactile-art representations to evaluate the strengths and weaknesses of the hypothesis that a mysterious ancient petroglyph in Chaco Canyon is an Ancestral Puebloan impression of the 1097 total solar eclipse with a storm in the solar corona.
- 3D Printable Tactile Models of Chaco Petroglyphs**: Downloadable files for creating two 3D-printed models based on spiral and curlicue petroglyphs at the Rock of the Sun in Chaco Canyon.
- Seeing the Sun's Corona with your Hands** (for sighted learners): Explore thermoform tactile-art representations of the Sun's corona, from an ancient petroglyph to NASA spacecraft images. Choose which of six images you are "seeing" with only your sense of touch.
- 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.