Welcome to Section 2:
Observing Pinhole Images of the Sun in Our Everyday Environments

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[Really] Understanding Paperhole Projection of the Sun

Follow along with our playful learning adventure!

And PLEASE give us feedback on these questions at the link below:

Insights gained?
Remaining questions?
Ideas for improvements?

https://tinyurl.com/PinholeFeedback

MARK 3 Version
Final Release for use up to and including the Annular Eclipse on 14 Oct 2023
Essential viewing:

6-minute “how-to-facilitate” video

[https://punch.space.swri.edu/punch_outreach_pinholeprojector.php]
**Introducing Bhanu**

*BAH-noo*

Bhanu means “ray of light” in Sanskrit.

Bhanu helps guide our way through these Sections. You are in **Section 2 of 5**.

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<td>Observing Pinhole Images of the Sun in Our Everyday Environments</td>
<td>teaches you how to observe the phenomenon of pinhole images of the Sun in our everyday world, both indoors and outdoors.</td>
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<td>Explaining and Understanding How Pinhole Imaging Happens</td>
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Pinhole Projection of the Sun

2. Observing Pinhole Images of the Sun in Our Everyday Environments

Bahnu says: Be alert to seeing pinhole images of the Sun every sunny day! The leaves in bushes and trees are like Nature’s camera but almost nobody notices. Learn to see this wonder hiding in plain sight and help others to see it too!

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Pinhole Projection of the Sun

Gaps between leaves are like the “pinholes” of our projector, and even these odd-shaped gaps create round images of our sun!

Sunlight comes from this direction

Sunlight passes through odd-shaped gaps between the leaves

The images of the Sun on the side of the building are round even though the gaps between leaves have odd shapes.
Pinhole Projection of the Sun

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 them at all times of the day and all times of the year.

We find them amid the shadows of trees with leaves or needles.

We find them on sidewalks, on snow, on fences, and buildings.

The images of the Sun come in all sizes and may be more round or more oval-like depending on the angle between the incoming sunlight and the projection surface.
Gaps between tree leaves make wonderful pinhole image displays as the Moon eclipses the Sun.

During solar eclipses it is easier to tell that we are seeing real images of the Sun.

Upper left image by Cantavestrella. See Credits & Acknowledgements for other photo credits.
Images of the round Sun projected on a sidewalk as **midday sunlight** passes through the small gaps between leaves of a tree. Notice that some of the dimmer images are in sharper focus.
Images of the round Sun projected on a sidewalk as sunlight passes through the small gaps near the base of fern-like leaves.

Notice the combination of regular shadows and pinhole projected images of the Sun.
Images of the Sun projected on the snow as low-angle sunlight streams through gaps among the pine needles.
Images of the round Sun projected on a fence as morning sunlight passes through the small gaps between leaves of a tree.
Images of the round Sun projected on a building as morning sunlight streams through small gaps between leaves of a tree.
Pinhole Projection of the Sun

Pinhole images of the Sun projected on a building as morning sunlight streams through gaps between the leaves of an Aspen tree.

When the Sun is lower in the sky (early morning and late afternoon) it is easier to see pinhole images of the Sun on a vertical surface.
Pinhole Projection of the Sun

We can also find pinhole images of the Sun INSIDE when sunlight shines through the leaves of a tree or bush outside a window.

Images of the round Sun projected on a wall as **late afternoon sunlight** passes through leaves outside a window.
Pinhole Projection of the Sun

Look for pinhole images of the Sun when sunlight passes through the narrow gaps at the edges of window blinds.

These small gaps at the edges of the blinds are long, thin rectangles.

But see how perfectly round are the images of the Sun they project on the wall!

Images of the Sun projected on a hotel room wall as morning sunlight passes through gaps at the sides of window blinds.
Pinhole Projection of the Sun

You can also find pinhole images of the Sun as sunlight passes through the tight weave of a straw hat.

The size and clarity of pinhole images depend on the size of the hole and the distance between the hole and the surface on which the images are projected (in this case CM’s hand).
Dozens of pinhole images of the Sun are projected on CM’s hand as the Sun shines through the tiny gaps in her straw hat.

What else can you find that will create pinhole images of the Sun?
ADDITIONAL INFORMATION

Link for Feedback
Valuable References
Credits & Acknowledgements
Links to PUNCH & PUNCH Outreach Products

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Valuable References

1. Lenses and Pinholes: What Does “In Focus” Mean?
A brief and clear explanation about what it means to be “in focus”:
https://www.physicsforums.com/insights/lenses-pinholes-focus-mean/

2. How a Pinhole Camera Works (Part 1)
Excellent diagrams:
https://www.scratchapixel.com/lessons/3d-basic-rendering/3d-viewing-pinhole-camera

3. Real image: Collection of focus points made by converging light rays
We love the simple but insightful stick-figure:
https://www.wikiwand.com/en/Real_image

4. Your Eyes See Upside Down and Reversed
Lucid explanation by an eye doctor (MD) relating human eye to a pinhole camera:
https://bceye.com/retinal-image-inverted-reversed/

5. Camera Obscura
The history of this wondrous effect, including reference to a possible paleo-camera:

A thorough and playful journey through the technical details of pinhole photography:
Credits & Acknowledgements

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Countless others (who participated in field testing events and gave us their feedback)

Thank you also to our web developer Don Kolinski for posting and updating our work on the PUNCH website.
Please proceed to Section 3:

Exploring Pinhole Projection with Your Own Hands

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