

Earth Science: 4 experiments to investigate wonder, *Fellow Elective*

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SUMMARY:	In this session we will learn how simple, fun scientific investigations can be used to infuse time nature with a sense of awe and wonder. We will also explore how engaging experiments can create new entry points into t'fillah for kids who are inspired by the natural world.
ABC GOALS:	<p>Affective: Participants will feel...</p> <ul style="list-style-type: none"> • A sense of awe and wonder • Curious about natural phenomena <p>Behavior: Participants will be able to...</p> <ul style="list-style-type: none"> • Conduct simple experiments with things commonly found at camp • Explain a few basic natural phenomena that are common at camp • Identify Brachot that connect with natural wonders at camp <p>Cognitive: Participants will know...</p> <ul style="list-style-type: none"> • How to help campers build a habit of inquiring about nature • How to plan for moments of curiosity at camp
AUDIENCE:	Younger camper and campers of all ages who love science
TIMING:	60 minutes
APPENDICES:	Brachot for nature, How to Static, How to experiments, Bill Nye/Steve Spangler books
MATERIALS NEEDED:	Mason Jars Magnifying Glasses Aluminum plate, pink insulation board, Fleece blanket, Balloon, Lightbulb, Flash light Triangular Prizm Sidewalk Chalk Cardboard boxes, Aluminum foil tape
SET-UP DETAILS:	

SESSION TIMELINE

- 00:00-00:10 – Introductions
- 00:10-00:40 – Experiment Rotations (Making Rainbows, Making Lightning, Sun Dial, Camera Obscura)
- 00:40-00:50 – Sharing observations (how wonder(full))
- 00:50-01:00 – Bringing it back to camp – teaching about lightning

SESSION OUTLINE:

Heschel on radical amazement:

“Our goal should be to live life in radical amazement... get up in the morning and look at the world in a way that takes nothing for granted. Everything is phenomenal; everything is incredible; never treat life casually. To be spiritual is to be amazed.”

Post quote in the middle of a large sheet of mural paper somewhere participants can see as they come in. Leave a lot of space on the borders for participants to write in.

00:00-00:05 – Wonderwall

As participants enter, invite everyone to write one or more answers to the prompt, “What is awesome?” around the quote. They can answer in words or in images. Ask participants to write their name beside their answer.

00:05-00:10 – How Awesome is Your Day?

Participants introduce themselves and rank their day so far on the following scale:

How full of wonder (or wonderful) has your day been so far?

1-No wonder at all – 5 radical amazement

You can have them line up in order on a tape line and share their name and the camp they are from.

00:10-00:30 – Science Experiments Rotations

Explain that participants will rotate between three stations. Each station has instructions and materials to conduct an experiment. Each experiment is connected to a natural phenomenon that is common at most camps. ***There are many ways to do these experiments. You can always switch to other experiments or other methods based on your comfort or on concepts that you want to teach. In this session, we are focusing on rain and lightning because often kids are scared of lightning. By gaining understanding of it, we might be able to dissipate kids' fears.*

Station 1 – Making Rainbows

1. Make a rainbow: With a spray bottle or sprinkler, spray water in the air in the sunshine. Try to find the rainbow. Alternatively, you can shine a sunray, or the beam of a strong flashlight through a clear jar of water or prism to produce a rainbow.
2. Participants should draw their observations with any colorful are medium.
3. Read the text:
אַת־קִשְׁתִּי נָתַתִּי בַעֲנָן וְהִיְתִהּ לְאוֹת בְּרִית בֵּינִי וּבֵין הָאָרֶץ:
I have set My bow in the clouds, and it shall serve as a sign of the covenant between Me and the earth.
4. Answer questions: Why are rainbows symbols of hope and unity?

Station 2 – Making Lightning

1. Make a spark: Using either a fleece blanket, or styrofoam sheets, aluminum foil plate, and a styrofoam cup, generate a little static electricity somewhere dark. Either admire the sparks on their own, or enhance the effect by generating the static with a CFL lightbulb in your hand.
2. Hair Raising: Rub a balloon on your hair to generate a static charge. Notice how the charge attracts your hair and makes it stand on end?
3. Answer questions: Static electricity is invisible. How many other amazing things or forces can you think of that are invisible?

Here is a great way to set this up: Charge and Carry - <https://www.exploratorium.edu/snacks/charge-carry>

See this link for more ideas: [Science tricks](#)

Station 3 – Camera Obscura (Sun observation tool)

1. Take a cardboard box (size of a copy paper box is ideal) Cut a notch in the lower section of the box so that you can look into the box. (Imagine making a a pair of goggles, but the box is the goggles).
2. Somewhere above the viewing hole, put a small pinhole in the box to let a tiny beam of light in.
3. Tape some white paper on the inside of the box, opposite the pinhole. (It's like a tiny movie screen!)
4. Seal the rest of the box as best as you can. Aluminum tape is the best.
5. Take your viewer outside and look into the box through the view hole cutout.
6. Look around. What do you see? Are you seeing things in front of you or behind you?

Solar Eclipse Viewer Instructions: [How to make a solar eclipse viewer](#)

Extension: In a similar way, you can make pinhole cameras. If you have access to a darkroom and Black and White Photography chemicals and paper, you can record the images in your pinhole camera!

Station 4 – Human Sundial

1. Find a sunny location on some pavement
2. Make an “X” with sidewalk chalk and ask a friend to stand on the mark.
3. Trace your friend's shadow with the chalk
4. Wait 15 minutes, and trace your friend's shadow again.
5. Answer question: How was the shadow different in the second observation? Why did it change? Is the sun really moving in the sky, or is the earth turning? How do you know?

Extension: Knowing that the sun moves in the sky from east to west, we can deduce that the shadows move from west to east. If you draw a straight line between the tips of the two shadows, you should have an east-west line. If you draw an intersecting perpendicular line in the middle you'll have a north-south line. Then you'll be able to tell what direction you are facing?

00:40-00:55: Sharing observations

Bring participants back together to share their observations.

Ask: What did you think was the most amazing thing you saw?

Ask: What do you think campers might be amazed by?

Ask: What brachot are connected to any of the things you observed?

On seeing the large-scale wonders of nature, such as mountains, hills, deserts, seas, long rivers, lightning, and the sky in its purity:

בְּרוּךְ אַתָּה יי אֱלֹהֵינוּ מֶלֶךְ הָעוֹלָם, עוֹשֵׂה מַעֲשֵׂה
בְּרֵאשִׁית.

Baruch atah Adonai, Eloheinu melech haolam, oseh maasei v'reishit.

We praise You, Eternal God, Sovereign of the universe, who makes the works of creation.

On seeing the small-scale wonders of nature, such as beautiful trees, animals, and people:

בְּרוּךְ אַתָּה יי אֱלֹהֵינוּ מֶלֶךְ הָעוֹלָם, שְׂפָכָה לוֹ בְּעוֹלָמוֹ.

Baruch atah Adonai, Eloheinu melech haolam, shekacha lo beolamo.

We praise You, Eternal God, Sovereign of the universe, that such as these are in Your world.

On seeing a rainbow:

בְּרוּךְ אַתָּה יי אֱלֹהֵינוּ מֶלֶךְ הָעוֹלָם, זוֹכֵר הַבְּרִית, וְנֶאֱמָן
בְּבְרִיתוֹ, וְקִים בְּמֵאֲמָרוֹ.

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Baruch atah Adonai, Eloheinu melech haolam, zocher hab'rit v'neeman biv'rito v'kayam ma-amaro.
We praise You, Eternal God, Sovereign of the universe, who remembers, is faithful to, and fulfills Your covenant with and promise to creation.

For flowers and herbs:

בָּרוּךְ אַתָּה יי אֱלֹהֵינוּ מֶלֶךְ הָעוֹלָם, בּוֹרֵא עֲשָׂבִי בְשָׂמִים.

Baruch atah Adonai, Eloheinu melech haolam, borei isvei b'samim.

We praise You, Eternal God, Sovereign of the universe, who creates fragrant flowers and herbs.

Hand out Heschel quotes (one quote for each person)

Ask: How could you create a time and process for highlighting wonder at camp?

Heschel Quotes on Wonder

"The greatest hindrance to knowledge is our adjustment to conventional notions, to mental cliches. Wonder or radical amazement, the state of maladjustment to words and notions, is, therefore, a prerequisite for an authentic awareness of that which is.

"Wonder goes beyond knowledge. We do not doubt that we doubt, but we are amazed at our ability to doubt, amazed at our ability to wonder. He who is sluggish will berate doubt; he who is blind will berate wonder. Doubt may come to an end; wonder lasts forever. Wonder is a state of mind in which we do not look at reality through the latticework of our memorized knowledge, in which nothing is taken for granted. Spiritually we cannot live by merely reiterating borrowed or inherited knowledge. Inquire of your soul what does it know, what does it take for granted. It will tell you only no-thing is taken for granted; each thing is a surprise; being is unbelievable. We are amazed at seeing anything at all, amazed not only at particular values and things but at the unexpectedness of being as such, at the fact that there is being at all."

BRINGING IT TO YOUR CAMP:

Participants browse science books, or search online for experiments that they could do with campers.

What adaptations or modifications might we make in order to help all campers participate fully in this activity?