

5. WE CIRCLE THE SUN

This Lesson's Goals

- » *To share an appreciation of the light and warmth that the Earth receives from the Sun*
- » *To affirm humanity's place in the cyclical nature of life on this planet*
- » *To understand that Sun is the source of energy for Earth and all on it*
- » *To see how plants and animals respond to light*
- » *To see the power of sunlight*
- » *To reflect [pun intended] on the metaphorical use of Light and Dark in Quaker practice*

Opening [5-15 min.]

Gather for a few moments of silent worship.

Sing a song or two and read the scripture to introduce the lesson's theme on the gift of the Sun's energy.

Share: Nearly everything on our planet depends on the miracle of the Sun's energy in one way or another. In many ways, we are sun-eaters. We eat light directly and take in vitamin D. We eat it through our foods which have converted it into edible energy.

Ask: how do we rely on the sun? Do we need sunlight? What did you eat for lunch or dinner? How did your vegetables grow?



Sample Agenda

Posting a simple agenda can help both the teachers and the children stay on track. Pick and choose which activities work best for your group.

- 1. Opening:** Silent Worship, Song, Scripture, Sharing
- 2. Group Activity:** Plants Grow Toward the Light
- 3. Small Group Activities:** If your total program time is less than one hour, you may want to focus on two to four activities from those listed below, allowing for the age and size of your group, season and weather, and space and materials needed.
- 4. Closing**
- 5. Sharing of Take-Home Materials**

Songs

It's a Beautiful Day
Turn, Turn, Turn
In the Bulb There is a Flower
Sing and Rejoice

Circle of the Sun
Morning Has Broken
Spring Has Now Unwrapped the Flowers
Vivaldi's The Four Seasons [for listening]

Scripture

Ecclesiasticus 42: 16, 22, 43: 1-5

As the sun in its brilliance looks down on everything, so the glory of the Lord fills his creation.
How beautiful is all that he has made,
Down to the smallest spark.
What a masterpiece is the clear vault of the sky!
How glorious is the spectacle of the heavens!
The sun comes into view proclaiming as it rises how marvelous a thing it is, made by the Most High.
At noon it parches the earth, and no one can endure its blazing heat.
The stoker of a furnace works in the heat, but three times as hot is the sun scorching the hills.
It breathes out fiery vapors, and its glare blinds the eyes.
Great is the Lord who made it, whose word speeds it on its course.

Scripture Discussion

Consider the technical knowledge available at the time Ecclesiasticus was written and notice that the scriptural passage takes on even greater power.

Plants Grow Toward the Light [5]

Showing how plants grow toward the light can be a two-week program, setting up the pots the first week and evaluating the second week.

Materials: A variety of potted plants, tape and markers

Two-week version: Bring a few potted plants of different types and set them in a place where they can get sunlight from a window or from one direction only. Water them, as needed.

Mark the sides to show which is toward the sunlight. Don't move them for a week and see if there are any changes. Ask the children what changes they might expect. You could take photographs.

Second week: Bring back the pictures and compare the plants. Have they grown? Have they oriented toward the light? Which are the most heliotropic?

One-week version: Bring some house plants on which you have subtly marked the

direction that is toward the light. Ask the students to point out which way the pots were facing as the plants grew. Help them to figure out why plants grow toward the light.

Children might enjoy seeing a time-lapse video of plants turning toward light. [<tinyurl.com/plantsturntolight>](http://tinyurl.com/plantsturntolight) and [<tinyurl.com/plantsturntolight2>](http://tinyurl.com/plantsturntolight2)

Small Group Activities

Select from these activities. Consider your group size and ages as well as facilities. Do you have a solar oven? Is there a place to hang wet things to dry?

1. Light and Dark [5-10]

Learn the chorus to 'Sing and Rejoice' which has a quick, almost ragtime feel.

- » What is positive about light? Quakers often speak of God as the Light, why?
- » What is positive about dark? What living things are active when it is dark?

2. Solar Evaporation [5-10]

Materials: Cloths, dishtowels or paper towels, water

Dampen some cloths, dishtowels, or paper towels.

Feel how wet they are. Hang them up or lay them out in direct sunlight.

Check 30 minutes later to see how much they have dried out. Your local humidity will be a factor. In dry climates, a difference is clear in half an hour.

Without the sun we would not have the water cycle. Ask the children how the sun might be important to our water cycle.

Answer: The sun warms water in lakes, streams, and oceans. The water evaporates and goes into the atmosphere. As it cools, water droplets come together to form clouds. When the clouds can no longer hold water, precipitation falls in the form of rain, snow, sleet, or hail. Water then returns to our lakes, streams, and oceans to be warmed by the sun and so the cycle begins again.

With older children, you may discuss the effects of temperature and humidity on drying time. One concept to offer is that warm air has a greater carrying capacity for water vapor. When it cools below the dew point, what happens?

3. Solar Power Discussion [5-10]

Materials: Poster paper and markers. Prepare ahead of time a line drawing of a neighborhood on a large piece of paper. Include streets, parks, parking lots, homes, a school, a few stores. Post the drawing where everyone can see it.

What do you use energy for? Children generate a list. Do you know what makes that energy now? (Fossil fuels) Are there any down sides to fossil fuels? (Pollution, global warming, water contamination, it is non-renewable – it will run out eventually, etc.) Any ideas how we could make energy that wouldn't have these problems?

Energy from the sun can be converted directly or indirectly into other forms of energy, like electricity and heat. You can cook with solar ovens and stoves, heat water with solar water heaters and produce electricity through solar panels. (Ideally have photos or mini examples of all these uses).

Reference the map you made. Ask the children where they might be able to install solar panels. Indicate each area by tracing it with a bright colored marker. Ask why they suggested these locations, if there are any locations they wouldn't put solar panels and why, what they might use instead, which areas might need the most energy and how they think life would be different if they lived in a solar powered neighborhood.

Excellent resources are available on solar energy for children on the web. Consider the materials developed by the National Energy Education Development Project. <need.org/solar>

Snack Ideas

Brew tea by sunlight. Enjoy sun dried fruits such as raisins, figs and apricots. If you were able to obtain a solar oven, eat what you cooked.

4. Solar Oven [10-20]

Materials: Solar oven and food to prepare and cook

Consult <solarcookers.org>

On a clear day with bright sunlight, set up a solar oven and cook a snack in it. Melt cheese on crackers, or bake a quick bread such as banana muffins. Once your group has some experience with solar cooking equipment, they can set up a solar cook-off event for your Meeting, school, or with families.

5. Sun and Season [10]

Materials: Globe, light source

Ask your group if anyone knows how the sun is related to the seasons. Who has lived in more northern or more southern latitudes? Temperature is more uniform in the equatorial areas, though there are still often wet and dry seasons.

Use a globe and a strong light source to illustrate basic workings of the solar system: how the Earth's axis tilt creates longer and shorter days and how these are reversed in the southern hemisphere.

How different might the Earth be if all days and seasons were the same?

Many spiritual traditions have festivals that mark the change of season. These are celebrations which explore the meaning of each season to the community of life. Share the solar calendar with the children: the two equinoxes (March and September 21st) and the two Solstices (June and December 21st).

Depending on the season, invite the children to develop a celebration for the upcoming equinox or solstice.

Ideas for rituals and celebrations may be found here:

[<littlebinsforlittlehands.com/winter-solstice-activities-kids>](http://littlebinsforlittlehands.com/winter-solstice-activities-kids)

[<rhythmsofplay.com/ways-celebrate-spring-vernal-equinox>](http://rhythmsofplay.com/ways-celebrate-spring-vernal-equinox)

[<greenchildmagazine.com/celebrating-autumnal-equinox>](http://greenchildmagazine.com/celebrating-autumnal-equinox)

[<rhythmsofplay.com/ways-to-celebrate-the-summer-solstice>](http://rhythmsofplay.com/ways-to-celebrate-the-summer-solstice)

This is a good time to see how much the sun has dried the wet things from the evaporation test.

Closing

Circle of the Sun [5-10]

Stand in a circle, facing the center, and ask a series of questions, such as the ones on the next page, of each child in sequence around the circle. As each answers, he/she turns to face out with hands up. When all are facing out, the group has made an image of the sun radiating light.

Consider the number in your group and select a line of questions that will get to the sun before you run out of people.

If you ask about energy sources, you can lead each one back to the sun, except for geothermal which is residual from planet forming, and atomic energy which is a replica

of what the sun does. The point: the sun is the source of most energy on the Earth.

To complete the circle, turn back to the center, take hands, lift them overhead, and lean back to make a second linked circle of the sun. Squeeze hands and then release.

Close by singing "Circle of the Sun" or ask each child to share: "Today I learned..." and close with silent worship.

Hand out a Take-Home Page.



Circle of the Sun Activity

Questions:

1. How do your muscles move?
2. Does that take energy?
3. Where does your body energy come from?
4. What have you eaten today?
5. Suppose you ate a raisin, what dried it?
6. What was the raisin before it was dried?
7. What do grapes need to grow?
8. Where does the water come from?
9. Where does rain come from?
10. What forms the clouds?
11. What evaporates the water?
12. Where does soil come from?
13. Where do plants get energy to grow?

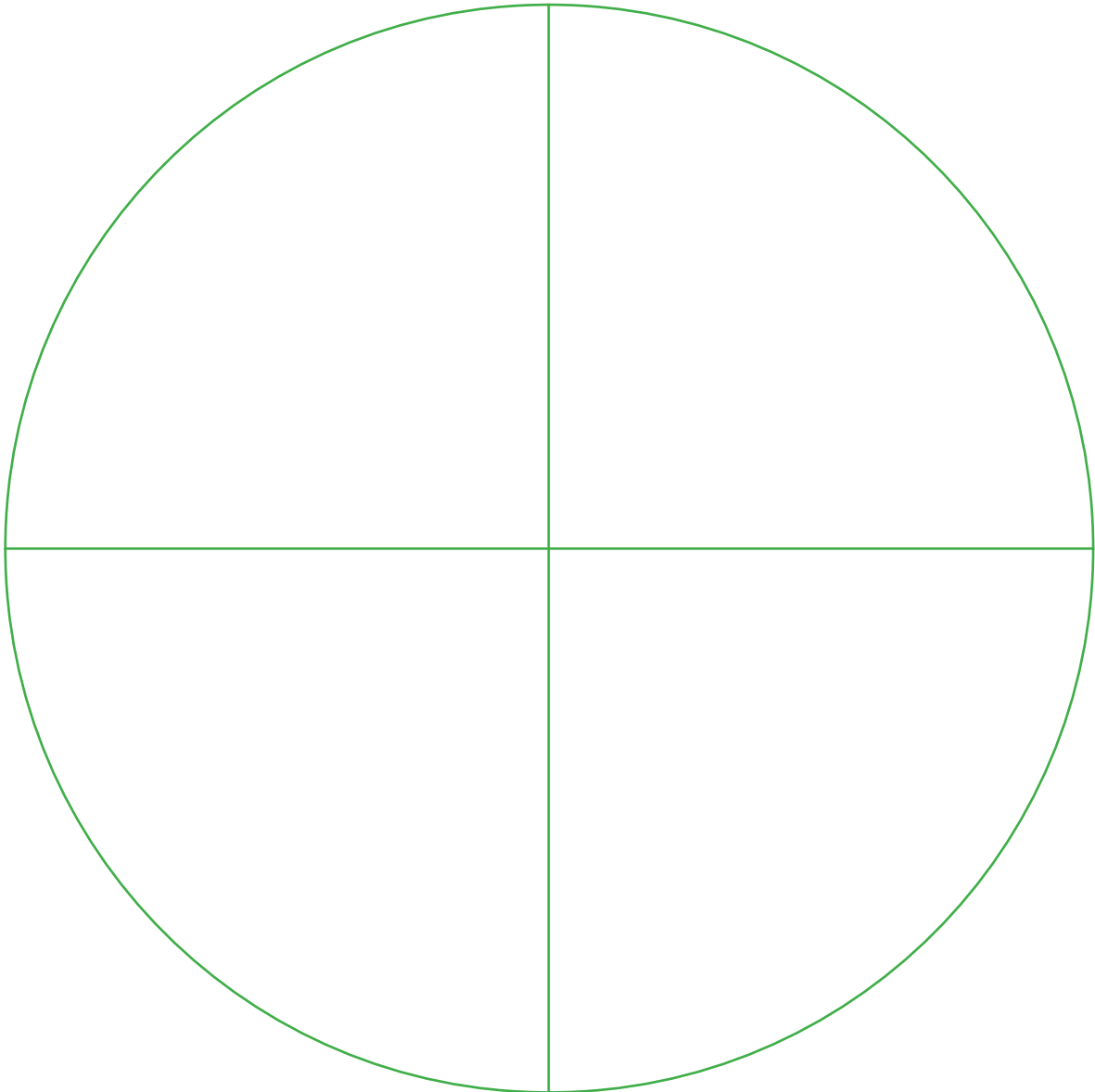
Possible Responses:

1. My brain tells them to, the nerves contract.
2. Yes.
3. Food.
4. Answers vary.
5. Heat, sunlight.
6. A grape.
7. Soil, water, sunlight.
8. Irrigation, rain.
9. Clouds.
10. Water vapor.
11. Sunlight.
12. Dead plants, worms etc.
13. The sun.

Our Seasons

Color an image for each of the seasons:

- » What plants or animals do you associate with each season?
- » What colors do you associate with each season?
- » What season is the most colorful where you live?
- » Which holidays or special events occur in each season?
- » Is this the same northern and southern hemispheres?



Making a Sundial

People used to tell time only by the sun. (This works best on sunny days.) One early kind of clock is a sundial. You can make one if you have an outdoor place in direct sunlight most of the day. It is possible to do a limited version indoors if you have an unshaded sun-facing window.



Materials:

- » strong dowel or metal rod sixteen to twenty inches long (a pencil works too)
- » mallet or hammer
- » string or circular object such as a plate
- » compass [or know north/south]
- » clock

Step 1: Locate a good relatively bare sunny place for your sundial. Hammer your rod or stick into the ground so it is firmly in place and straight up and down. It should stick up a foot or thirty centimeters to cast a good shadow.

Step 2: Draw or mark off a half circle or more about a foot in radius on the side of your rod away from the sun, [where the shadows will fall,] with the rod at the center of the circle.

Step 3: At exactly noon, standard time, look to see where the shadow of your rod falls. [It should be close to due north of the rod in the northern hemisphere]. Mark the spot. Use chalk on sidewalk, pebbles or sticks on the ground, markers on a plastic sheet.

Step 4: To completely calibrate your sundial, you will need to mark where the shadow falls each hour from sunrise to sunset and number your marks.

Step 5: If you have marked the shadow points carefully and numbered them, you can use your sundial to tell time. If the shadow is halfway between the marks you made for 2 o'clock and 3 o'clock, you can guess that the time is 2:30.

- » When is the shadow the longest?
- » When is it the shortest?
- » How will your dial work in other seasons of the year?

How is Spirit revealed in the workings of a sundial?