Shadow Plot

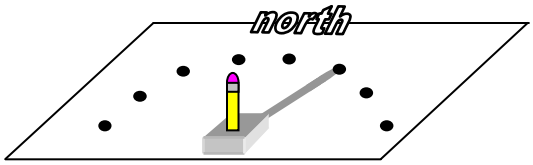
Students make a shadow plot to determine north/south direction so they can "aim" their solar cookers at the sun in an optimal position. Demonstrate these procedures to help students arrange their shadow plots correctly.

Each Group Needs:

- One large sheet of poster-size paper or newsprint (even newspaper will work)
- One pencil to act as a gnomon (it's best if all pencils used are the same length)
- Builder's level
- Small cardboard box or ball of clay to hold the gnomon
- Sunny location (free from shadows)
- One black marker
- Rocks, books, or building blocks to keep paper flat

Procedures:

1. Starting as early as possible on a sunny morning, select a flat space to work out-of-doors. Secure the gnomon (pencil) in the clay or box. Place it on flat ground and use the builder's level to make sure the gnomon is exactly perpendicular to the ground.
2. With the base on the ground and the gnomon pointing straight up, look for its shadow. In the morning, the shadow points west. (A compass can help you find magnetic north for closer precision.) Place the paper under the gnomon, positioning it lengthwise east to west. The gnomon base should be set at the center bottom (south) edge of the paper (see illustration). If for any reason the study might be interrupted during the day (making reassembly necessary), trace around the paper in chalk.
3. Trace the gnomon base on the paper to ensure constant position throughout the day.
4. At equal intervals (at least hourly), draw a dime-sized dot around the top of the shadow cast by the gnomon. Write the time near the circle each time a measurement is taken.
5. At the end of the day, draw a line connecting the circles. (At a later time, talk about what this arc describes.)
6. Using a ruler, determine which shadow length is shortest by measuring from the dots to the base of the gnomon.



Depending on daylight savings time and where your school is within its time zone, the shortest shadow should occur between 11:00 a.m. and 1:00 p.m. The hour around the short shadow time is the optimum cooking time, because the sun's rays are most direct at that time. Whether students can cook during this period or not, the shadow plot will help students "aim" their solar cookers for optimal exposure to the sun.

Note: *These shadow plots can be saved and used over time to show seasonal change. Merely use a different color to represent each season when drawing circles.*