Experiment - Measuring the diameter of the Sun

AIM

To safely measure the diameter of the Sun.

MATERIALS

- cardboard centre tube of a roll of foil or plastic wrap
- white card (a file card is good)
- sewing pin
- graph paper (10 squares to the centimetre)
- Stanley knife or scissors
- ruler
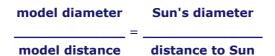- pencil
- masking tape or sticky-tape

METHOD

1. Cut the cardboard tube so it is 50 cm long. Be as exact as possible.

2. Cut a small viewing hole in the side of the tube near End B (see the first figure below).

3. With a pencil, trace the end of the tube on the white card and the graph paper. Cut out both circles and carefully attach them to the ends of the tube as shown in the figure.

4. Accurately measure the distance from End A to End B.

5. Use the pin to put a small hole in the centre of the card at End A.

6. Take the viewer outside and point End A at the Sun while looking through the viewing window at the graph paper. When the viewer is correctly aligned a small circular image of the Sun should appear on the graph paper.

   CAUTION: Never look directly at the Sun. It will damage your eyes.

7. Use the lines on the graph paper to measure the diameter of the image.

   In the viewer model the position of the pinhole represents the position of the Earth and the distance from the hole to the graph paper represents the distance from the Earth to the Sun. To calculate the actual diameter of the Sun a simple ratio can be used.

$$\frac{\text{model diameter}}{\text{model distance}} = \frac{\text{Sun's diameter}}{\text{distance to Sun}}$$

DISCUSSION

1. Consider the estimate you made and compare it with your calculated value. How accurate were you?

2. The actual diameter of the Sun is 1 390 180 km. Now consider your calculated diameter. How accurate was your measurement?

3. To obtain a more accurate answer, repeat the measurement a number of times and calculate an average. You could do this yourself or you could pool the class results and average them. Does this give you a more accurate result?

4. What other sources of error could there be in this activity? Explain how each source of error might be overcome.

Cardboard tube with viewing hole

Measuring the diameter of the Sun