



By Dr. Eugene F. Mallove

Measuring The Diameter Of The Sun

If you know how far away the Sun is from Earth, it is not difficult to measure the Sun's diameter using simple household equipment. The Earth follows an elliptical path around the Sun, really almost a circular orbit. The nearest approach distance to the Sun, the "perihelion," is about 91,300,000 miles and occurs during winter in the northern hemisphere. Earth is furthest from the Sun at "aphelion," about 94,500,000 miles, in the summertime in the northern hemisphere. Take then the average distance between Earth and Sun, the so-called "astronomical unit" or AU, to be about 93,000,000 miles.

Knowing the value of the astronomical unit, if you want to measure the Sun's diameter yourself, this is how to do it. Find a room which has a sun-facing window and which you can make quite dark if all the lights and blinds are closed. Use your own cut-and-paste method to place a black sheet of construction paper on the window glass while blocking off all other sources of light with the shades, cardboard, etc. The objective is to have a pinhole in the black construction paper admit a cone of light from the Sun into the room. You may make a pinhole in the construction paper directly or make a smoother pinhole in a piece of black tape placed over a larger hole cut in the construction paper.

Using a sheet of white paper in the darkened room, catch the expanding cone of sunlight to form

an image of the Sun on the paper in the darkened room. Hold the paper at such an angle that the Sun's disk appears round. For accuracy in the overall measurement, it is best to form an image large enough to measure accurately with a ruler. By moving the white sheet further away from the pinhole, the Sun's image gets larger.

Looking at the diagram in the above illustration, you need to measure the distance, L, from the pinhole to the sheet and the diameter, D, of the Sun's image on the sheet. The ratio of D to L will be the same as the ratio of the Sun's diameter, S, to its approximate distance from the pinhole (93,000,000 miles). Find the Sun's diameter, in miles, from the simple formula:

$$S = D/L \times (93,000,000).$$

Did you get a number anywhere near 864,000 miles, the diameter of the Sun's visible surface or photosphere? The Sun's diameter is over 100 times Earth's equatorial diameter of 7,926 miles. The volume of over a million Earths would, in fact, fit comfortably within the Sun.

Dr. Eugene F. Mallove

Dr. Mallove encourages readers to send in questions and will occasionally devote a column to them. He lectures on topics involving astronomy and the space program to groups and organizations. He can be reached at 428 "72."