Many Suns ... around our feet

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Objective: To discover that Nature has invented the principle of the photographic camera long before Man

Materials: Leaves on the trees, the Sun, a ruler, a pencil and a small notebook

Experience: Walking through foliage in autumn, spring or summer, you can see on the ground elliptic discs, which are more or less luminous and are nothing but faithful images of the Sun projected through tiny holes in the tree foliage (see Figs. 1 and 2 for the small discs of light projected on the table). Some of these ellipses will be drawn in an observation notebook, and their approximate dimensions, for example 5 cm for the minor axis of one of the ellipses, will be measured by means of a ruler (Fig. 3).

We admire the sometimes very ephemeral character of some of these discs, according to the mood of the wind that shakes the leaves.

Finally, we will try to locate a stable disc and by projecting the shadow of our head on it, we will see in the foliage the hole through which the Sun pierces to print its image on the ground (Fig. 4).

By multiplying by 114 the value of the minor axis of the ellipse (i.e. 5 x 114 = 570 cm), the distance between the disc and the hole in the foliage is obtained

Figure 1

Figure 2

Figure 3

Figure 4

Explanation: Fig. 5 shows the working principle of a camera obscura, the ancestor of all cameras. The rays of the Sun located to the right pass through the small hole drilled in what could be one of the faces of a shoe box (or the foliage of a tree). The diameter of the Sun is about 1/114 radian (*), and the distance between the Sun disc and the hole is obtained by multiplying by 114 the dimension of the minor axis of the Sun ellipse (cf. 5 cm) projected onto the face of the camera obscura located on the left (cf. the ground in the previous experiment): 5 × 114 = 570 cm.

(*) If a coin whose diameter is 1 cm is worn at a distance of 114 cm from our eye, it will be seen with an angular opening of 1/114 of radian, the same value as the angular diameter of the Sun ... or of the Moon.

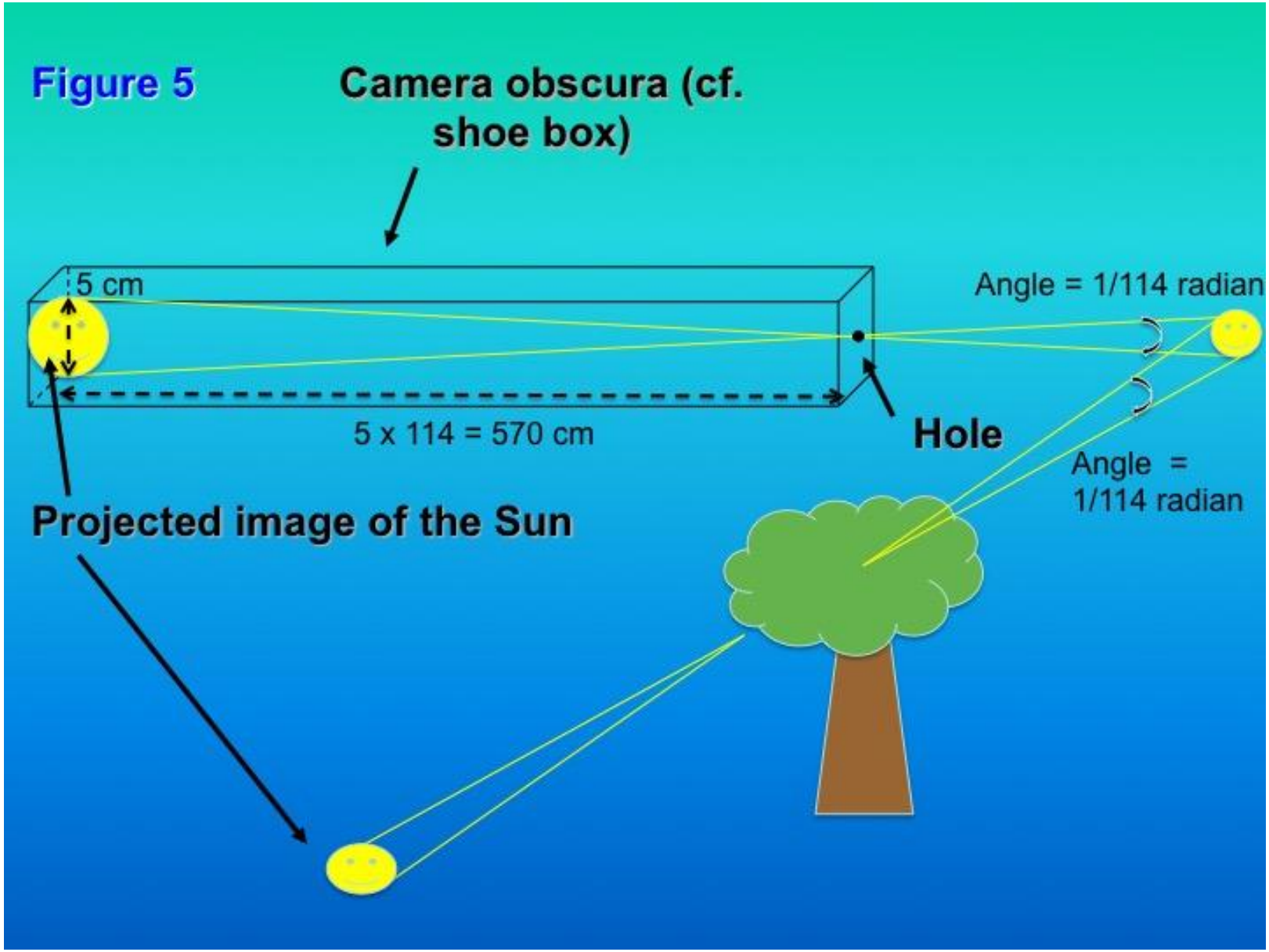
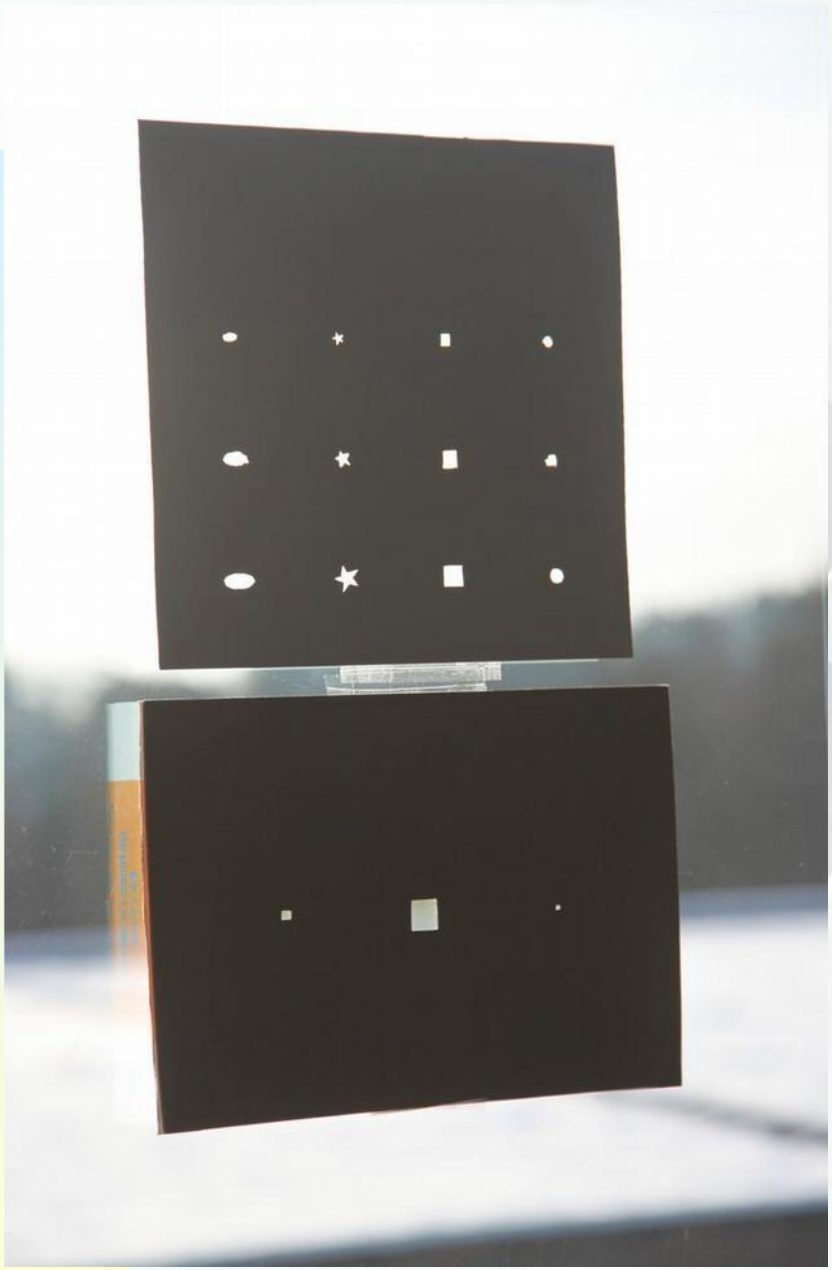


Figure 5
Camera obscura (cf. shoe box)
5 cm
Angle = 1/114 radian
5 x 114 = 570 cm
Hole
Angle = 1/114 radian
Projected image of the Sun



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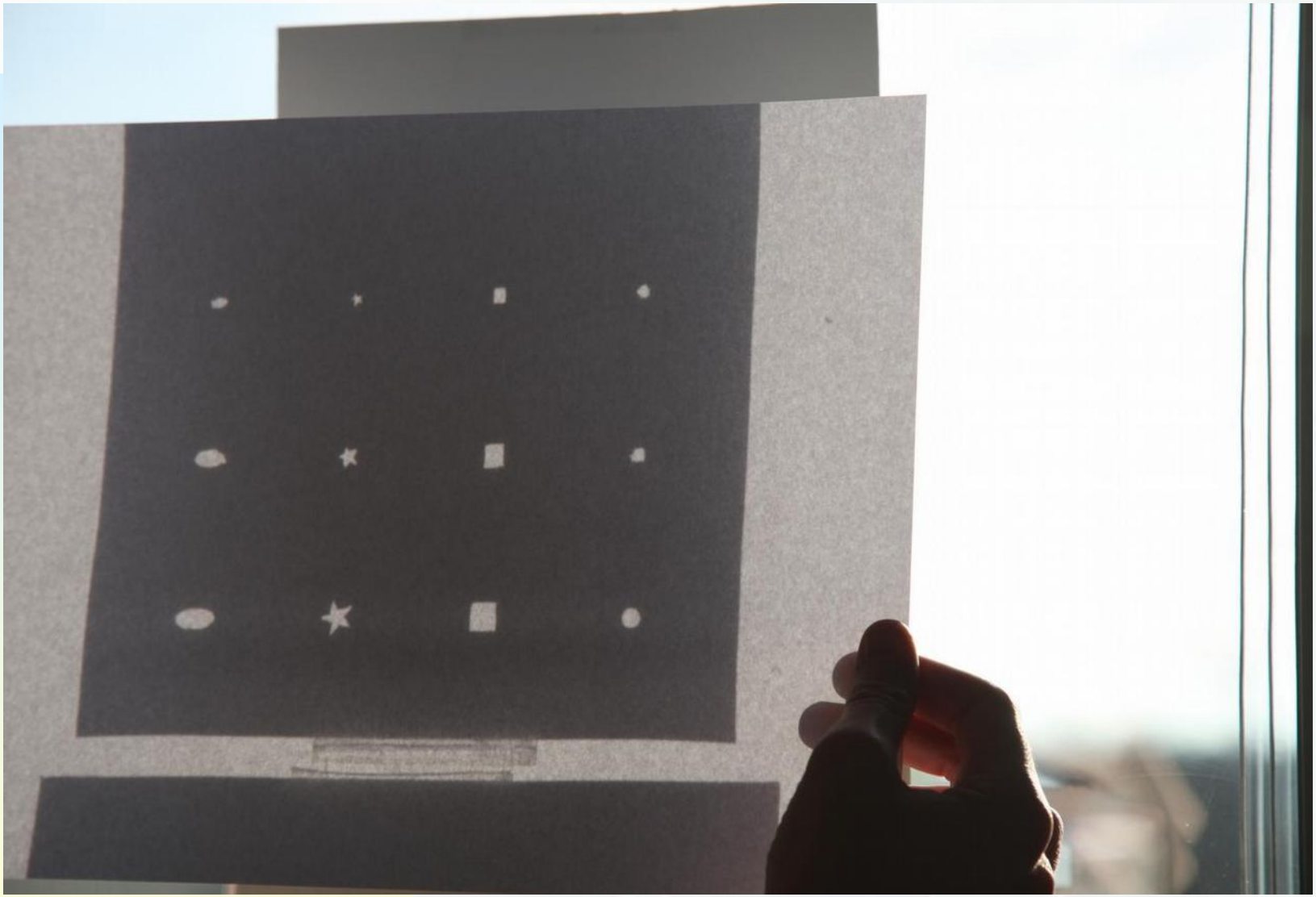

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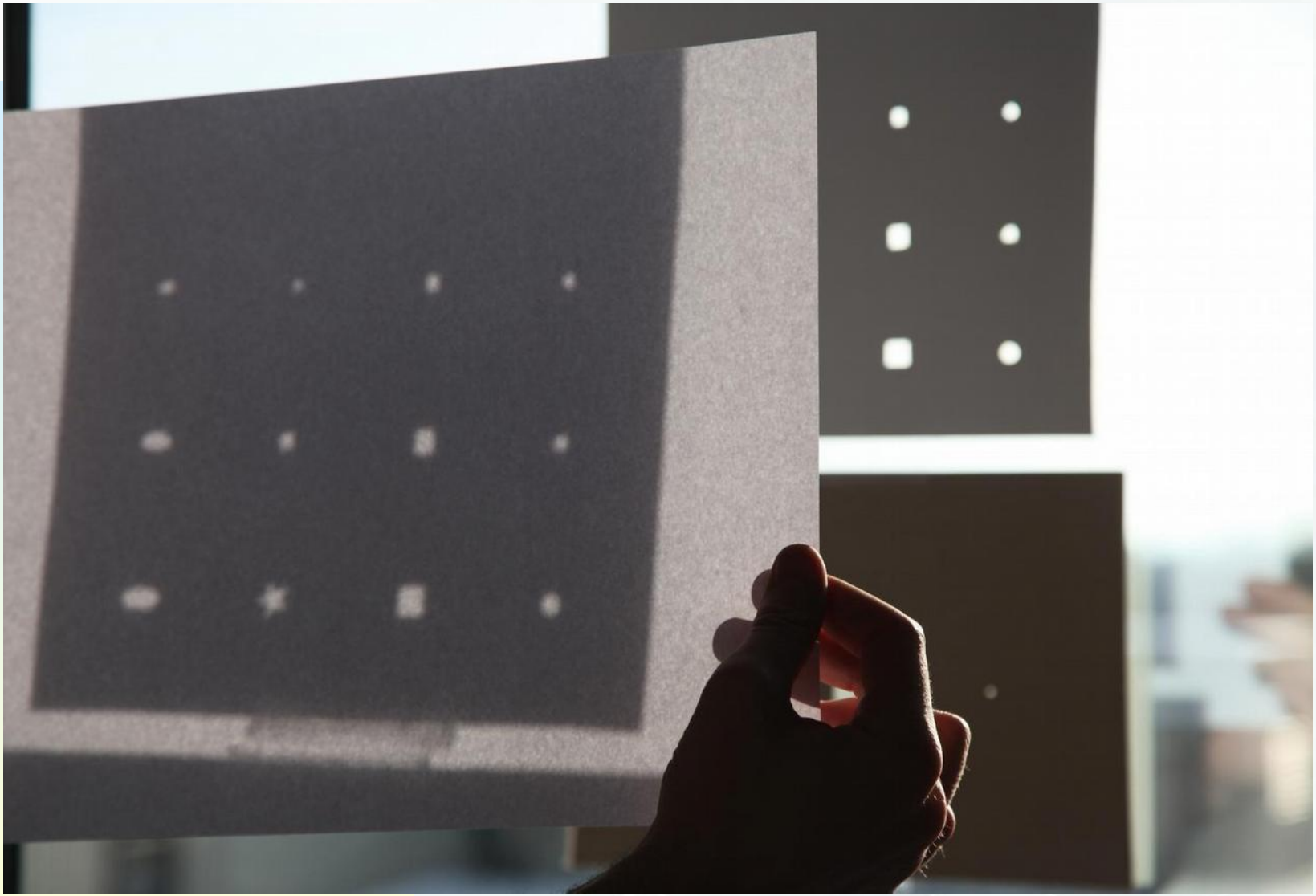

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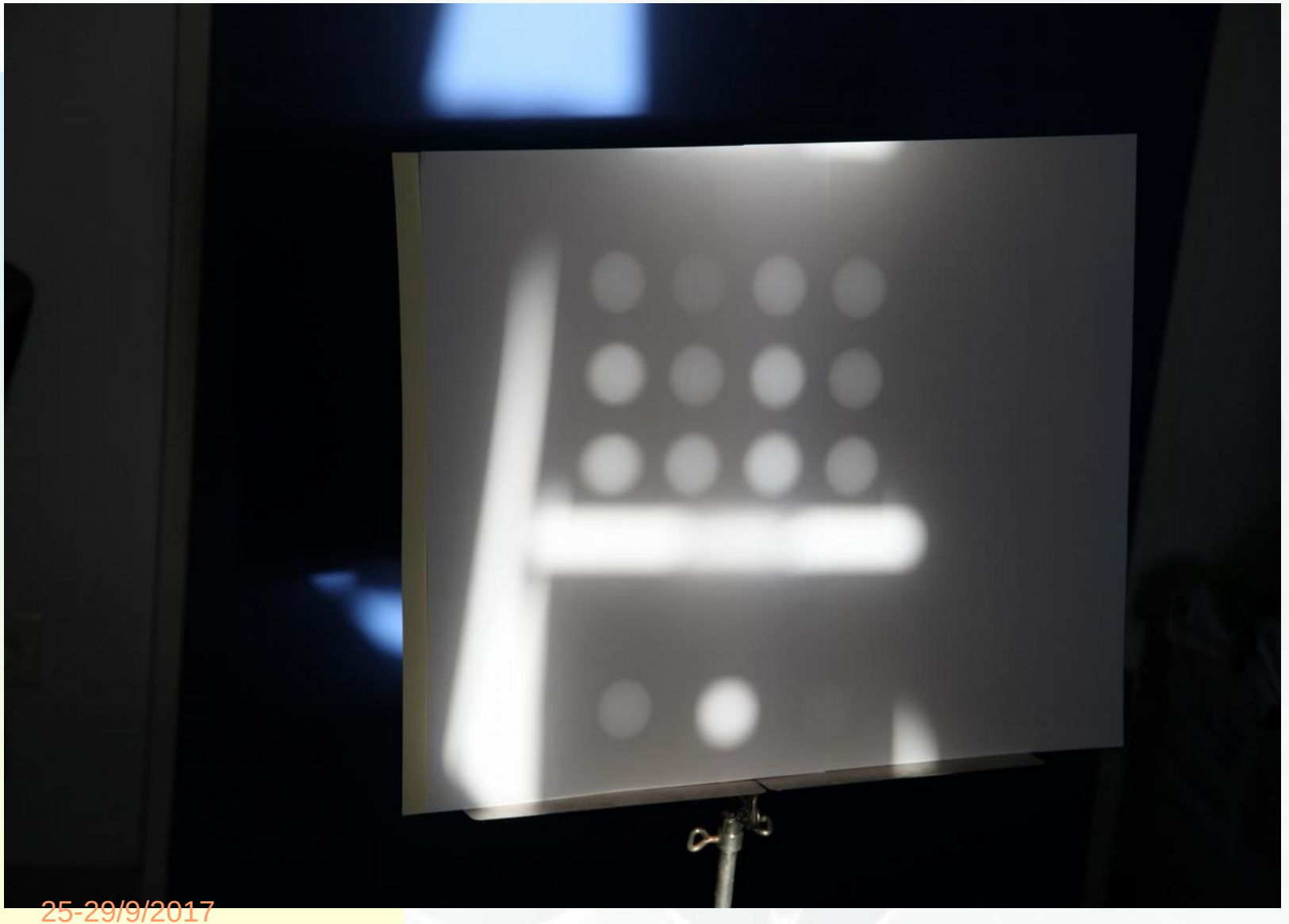

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