Sky Watchers' Association of North Bengal

(Regd. S/1L/77828- 10-11)

Affiliated to Confederation of Indian Amateur Astronomers (CIAA) & Astronomers Without Borders (AWB)

Easy Telescope/Solarscope (SWANscope) making

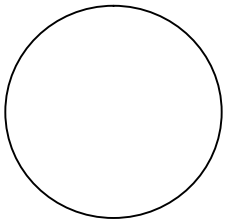
Design: Debasis Sarkar on behalf of SWAN (Sky Watchers Association of North Bengal. www.skywatchers india.com)

Objective: To develop a design easy to build with items freely available in small towns at low cost (Less than Rs 100).

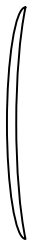
Design:

Items needed for a single piece of SWANscope

1. Spectacle lens: +2 Diaptor, 60 to 70mm diameter (1 pc)

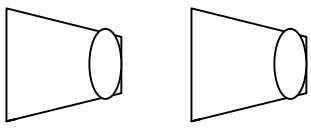


Front view



Side View

2. Watch makers magnifier : Number 1. If not available, 1.5. The number denotes its focal length.



3. Black masking paper, paper tube, gum, Pin, cello tape etc.

Construction design of a basic telescope:

A B

Here A is the objective of main lens and B is the eyepiece. While A will form an image at or near its focus, B will magnify it.

If we consider Focal length of A as F1 and Focal length of B as F2.

F1/f2 = Magnification of the whole system.

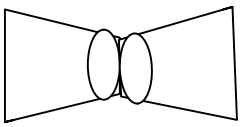
Ex: A lens of Focal length 1000mm and Eye piece Focal length 25mm. F1=1000 and F2 = 25mm

So, magnification of the system is 1000/25 = 40. Or 40 times.

Construction note:

Single element eyepiece o r eyepiece with single lens causes high level of distortion. So, we will make our eye piece with two lenses.

Hold the two magnifiers back to back and tape or glue them. Caution should be taken not to allow the gum to spill on the lens. So, it becomes like-



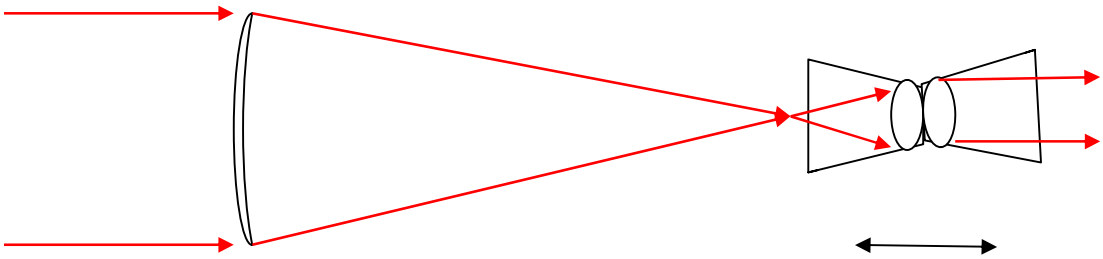
Here, two lenses of 1 inch (25mm) focal length, attached to each other will have a resultant focal length of almost 25/2=12.5mm. So, now we have an eyepiece of two elements and 12.5mm focal length.

The objective lens is of +2 diaptor. As we know, the relation of term, diaptor with Focal length of a lens is like 1000mm/Diaptor = Focal length. So, the lens here is of 1000/2 = 500mm

So, for our SWANscope: F1 = 1000mm and F2 = 12.5mm. Thus, magnification is 1000/12.5= 40X.

Final construction

Red lines are light path.



Fixed Objective or front lens Movable eyepiece

The lenses can be fixed in any fashion. Care should be taken to ensure parallel placement of both objective and eyepiece. Axis of both should be as best as possible aligned to each other.

The lenses can be placed inside a tube of slightly larger than 500 mm length. Matt black paint or covering with black masking paper inside the tube will produce image of higher, thus, better contrast. A system must be there to move the eyepiece back and forth. This will ensure focus.

This SWANscope can be used to directly view Moon or any terrestrial objects. On the other side, can be used to project sun over a screen to observe events like Venus Transit or Study Solar spots.

The shape or spectacle lens is convex in one side and concave in the other side. This is called concavo convex shape which is not ideal for a telescope. But a compromise has been accepted in this design to minimize cost and ensure availability of raw materials even at a very small place.

History, after prototyping the design, it has been first demonstrated at national level resource person development workshop organized by Vigyan Prasar (Government of India) and Nehru Center held at Allahabad from 24th to 26th April 2012. Debasis Sarkar was one of the faculty members in the workshop. After successful demonstration of the set, many participants started buiding that for own and afterward replicated the item in huge numbers at their own.

National Council of Science Museum sponsored a SWANscope making workshop at North Bengal Science Center (Siliguri, West Bengal, India) conducted by SWAN members on the 19th may. School students were trained in making this item. All materials to build the item and other logistics were provided by NCSM. Students built their own SWANscope and took that home. Afterward, they replicated this at own school.

First serious usage of SWANscope was on the Transit of Venus day on the 6th June 2012.

It was used at many places including North Bengal Science center or SWAN's own project site. The set reproduced acceptable resolution and showed Venus and Solar disc with acceptable contrast. It has also been tested to watch moon. The outcome was of quite good sharpness.

Further reading:

Shoot the 'Never Again' Transit of Venus 2012. Science reporter (Council of Scientific and Industrial Research.) May 2012 issue by Debasis Sarkar.