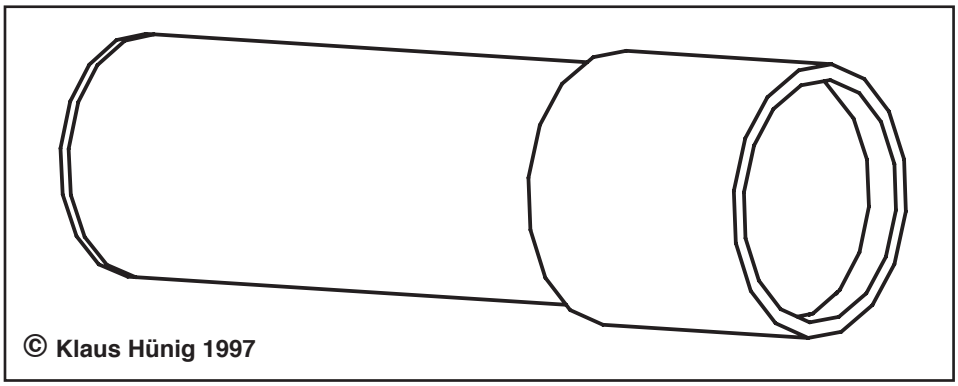
OPITEC

Hobbyfix

# 115.051

# Kaleidoscope





## *Notes to the Opitec Kaleidoscope*

The Kaleidoscope was developed in 1816 by the Scottish scientest Sir David Brewster (1781-1868) and was one of the great discoveries of the time.
He made many dicoveries, however he will be rembered for the Kaleidoscope. Within two years of his discovery hundreds of thousands of Kaleleidoscopes were made all over Europe.
People were fascinated by the unending number of patterns that could be seen. Considering the principle of Kaleidoscope is so simple, it is a wonder that it was not developed earlier. It consists of a a tube in which two or more mirrors are set at a certain angle. The objects at the end of the tube reflect patterns in the mirrors. Most commonly the design consists of three equally spaced mirrors, set in a triangle 3 x 60°. Using different sized mirrors, finer patterns are possible. eg with the three angles 45°, 45° and 90° or 30°, 60° and 90°. Better kaleidoscopes have a lens as an eyepiece to achieve a sharper picture.
Also available are Kaleiodoscopes which incoroprate fluids instead of small pieces of glass as objects, or a wheel with pictures or even a large coloured glass ball that will turn at the end of the tube.
There is no end of ideas that are possible.
If you wish to experiment with the Opitec Kaleidopscope you can buy extra polystyrol mirror (Order No. 874539)
The OPTI media lenses Nr.4-9 make it possible to make a mini model (45 mm long) right through to a 350 mm supertube.

**Please Note**

The OPITEC range of projects is not intended as play toys for young children.They are teaching aids for young people learning the skills of Craft, Design and Technolo- gy.These projects should only be undertaken and tested with the guidance of a fully qualified adult. The finished projects are not suitable to give to children under 3 years old. Some parts can be swallowed. Dan- ger of suffocation!

## 1. Product information:

**Article:** Working model

**Suitability:** Key Stage 3 11-14 years

## 2. Material information:

**2.1 Material:** Card tube (made from recycled paper)

**Working:** Already finished

**Joining:** Glueing, inserting

**Finish:** Paint or decorate as you wish.

**2.2. Material:** Plastic sheet ( PVC theromplastic)
clear

**Working:** Cut with scissors or with a modelling knife.

**Joining:** Glue

**2.3. Material:** Lens (Acrylic PMMA, themoplastic)
Transparent.

**Working:** Pre-made part

**Joining:** Glue

**2.4. Material:** Mirror card (Poloystyrol) thermoset

**Working:** Pre-made part

**Joining:** Glue

**Finish:** None necessary

**2.5. Material:** Celular rubber foam (Polystyrol thermoset)

**Working:** Cut with scissors

**Joining:** Glue

**2.6. Material:** Transparent paper
Coloured

**Working:** Cut with modelling knife

**Joining:** Glue

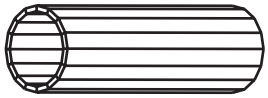
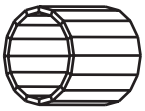
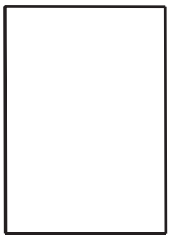
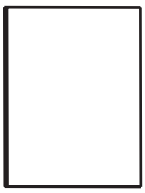
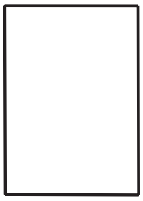
## 3. Tools:

**Cutting:** Scissors, modelling knife

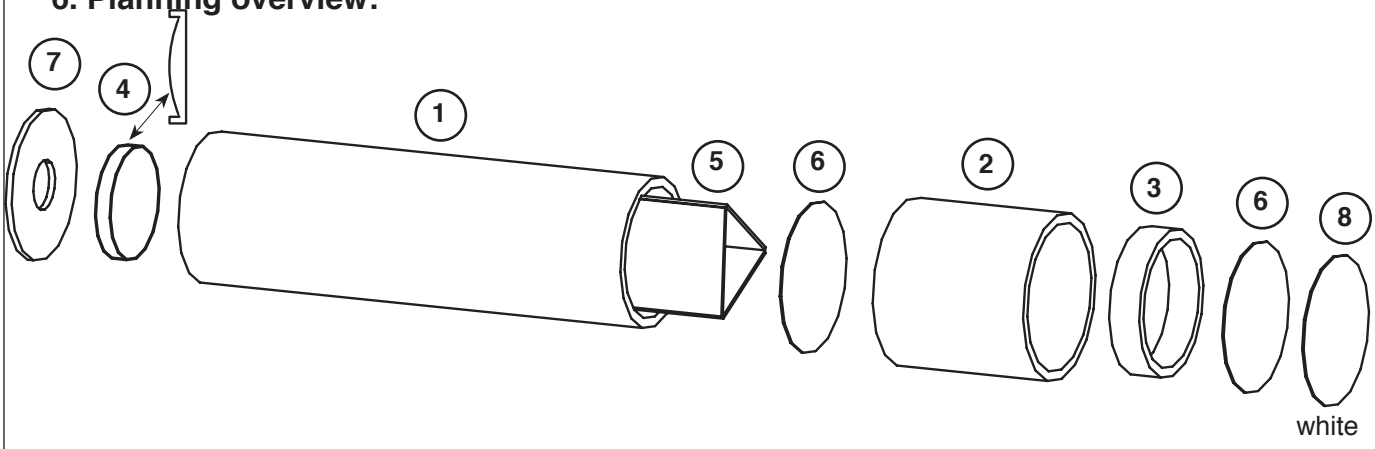
***Note!:*** Be careful when using a sharp blade!!

**Glueing:** Solvent free: universal glue

## 4. Parts list:

| Part | Material | Quant. | Diagram | Size |
|---|---|---|---|---|
| **Long tube** | Cardboard | 1 |  1 | 147 x 46,1/40,3 x 2,9 mm |
| **Short tube** | Cardboard | 1 |  2 | 50 x 52,5/46,3 x 3,1 mm |
| **Ring** | Cardboard | 1 |  3 | 10 x 46,1/40,3 x 2,9 mm |
| **Lens** | Acrylic | 1 |  4 | f = 225 mm; ø 34,5 mm |
| **Mirror prism** | PS | 3 |  5 | 1 x 33 x 140mm |
| **Foil** | PVC | 1 |  6 | 0,5 x 120 x 120 mm |
| **Cover disc** | Cellular foam | 1 |  7 | 2 x 95 x 100 mm |
| **Transparent paper** | Paper | 5 |  8 | 100 x 100 mm<br>Assorted colours |

## 5. Exploded drawing:
## 6. Planning overview:



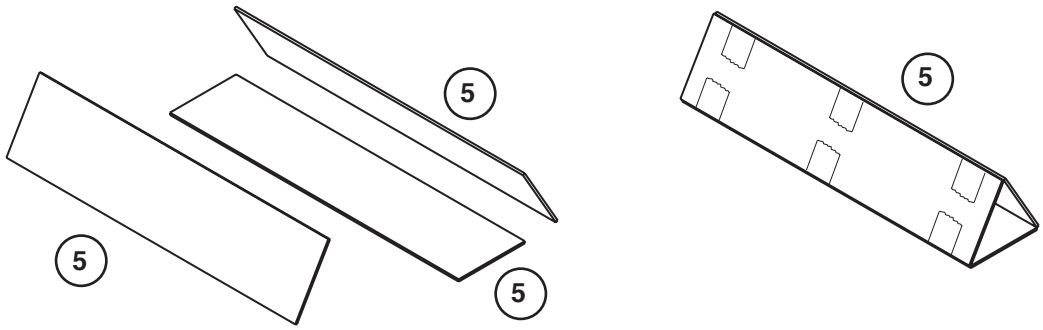

6.1. Making the mirror prism
6.2. Assembling the mirror prism
6.3. Mounting the lens as an eyepiece
6.4. Making revolving chamber
6.5. Filling and testing the chamber

## 6. 1. Making the mirror prism:

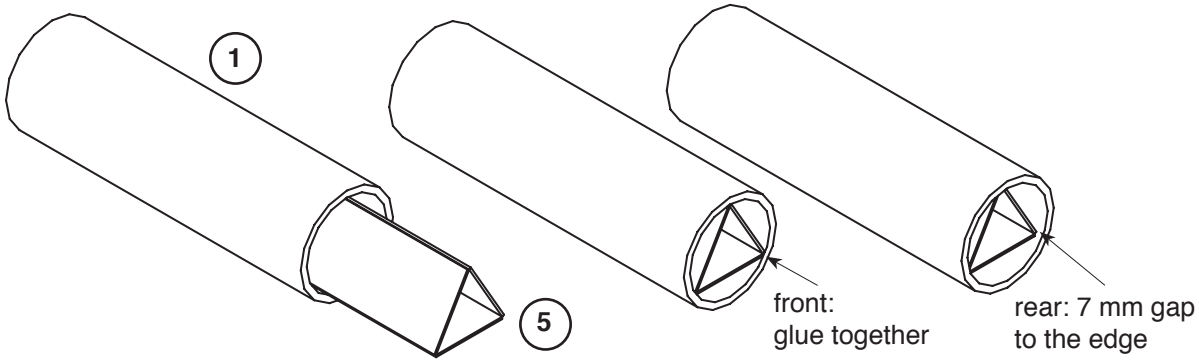
6.1.1. Remove the protective film from the three strips of polystyrol mirror. Assemble the three parts into a prism and fix them with asdhesive tape. The mirror side faces inwards and the parts must be accurately assmbled.

## 6.2. Assembling the mirror prism:

6.2.1. Insert the mirror prism as far as possible into the tube. There should now be a gap approx 7 mm left




***Note:*** If the mirror prism does not fit accurately you can wrap a roll of paper around the outside of the mirror or glue the prism in place.

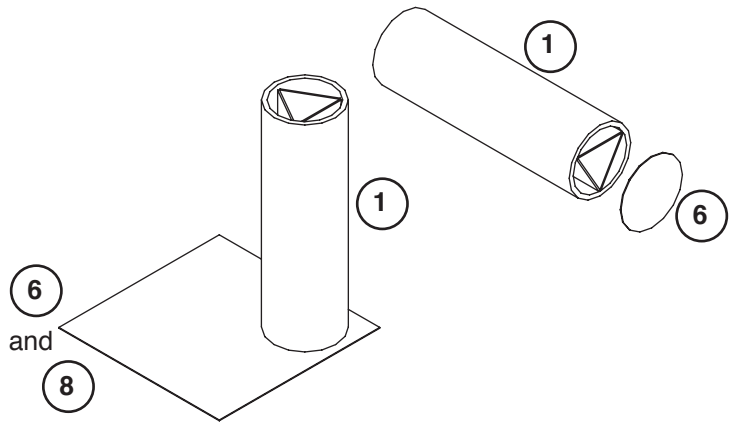


## 6.3. Mounting the lens as an eyepiece:

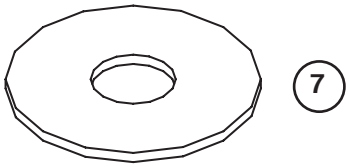
6.3.1. Cut two 46 mm dia discs out of the plastic sheet (6) and one from the transparent paper. To do this place the cardboard tube (1) upright on the transparent plastic sheet (6) and on the trnnasparent paper (8). Draw around the end of the tube so that they fit exactly on the end of the tube.

6.3.2. Glue a disc of transparent plastic on the end of the disc where the mirror prism is level with the cardboard tube end.

6.3.3. Make a another disc the same size from the cellular foam (7). Make a further hole in the middle of this disc approx 16 mm dia.

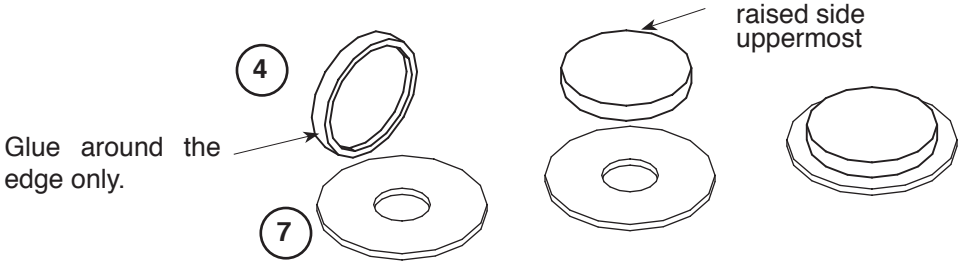



6.3.4. Glue the lens, flat sude dowm over the hole.

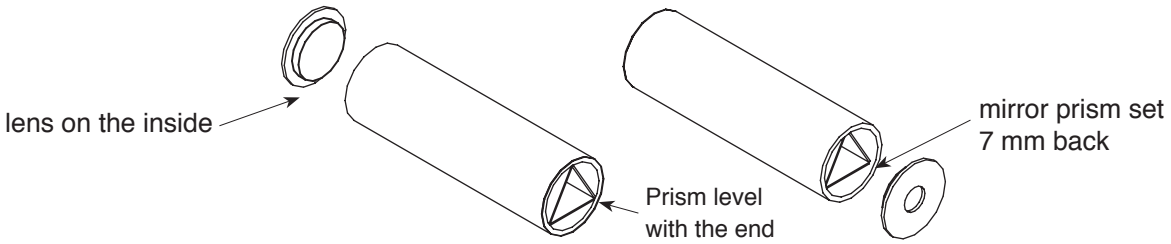



***Be careful!*** Do not allow any glue to get onto the lens. Spare lenses: Order No. 839.100 lens 8

6.3.5. Fianlly glue the cellular faom disc and lens (facing inward) into the open end of the cardboard tube ,where the prism is set in about 7 mm

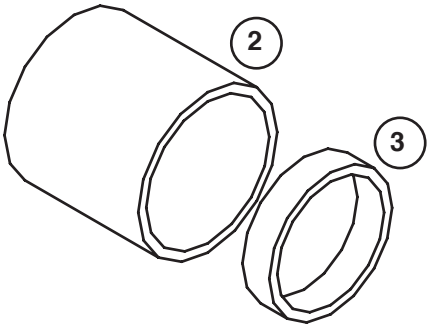


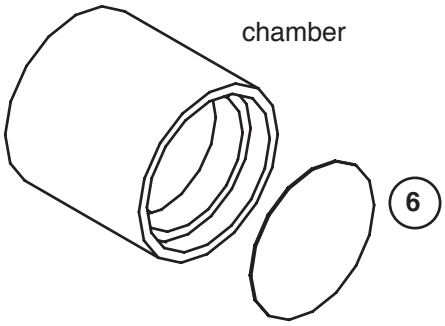

Now the mirror tube is ready and you can look through it. Try holding your finger at the end.
How many fingers can you see?



## 6.4. Making the revolving chamber:

6.4.1.The cardboard chamber (2) and the smaller cardboard ring (3) sholud be painted black on the ends with a felt tip pen. Push the smaller ring (3) into the tube (2) until it is 5-10mm from the end and glue it in position.




6.4.2. Now glue the second transaparent disc (6)over the end of the inner ring.

## 6.5. Filling and testing the chamber:

6.5.1. Now the kaliedoscope will function.
You can fill the end of the ring with snips of coloured tissue paper or broken bits of plastic etc. (be careful not to cut yourself) You can also use bird feathers , glass balls or any other objects so long as the measure less than 5 x 5 mm then yo slide the chamber on to the tube as far as it will go.
Now you have a chamber the width of the cardboard ring (3) with the objects enclosed in the chamber. So when you look through the lens and turn the ouer tube the parts inside will fall making ever chaning patterns. By removing the end tube you can try new materials

6.5.2. The disc of transparent paper (8) can be stuck across the end to the carboard tube (6) If you wish to be able to see into the tube you can leave this disc off. Fianlly you can decorate the outside of the kaleidoscope using coloured or holographic paper.

Your Kaleidoscope is now complete!