Practical instructions & drawings

The camera

You can make a pinhole camera of any suitable sized light-tight box, painted matt black inside, or build it of matt-black cardboard using the camera drawings.

Building the camera is not difficult, but care is needed to make everything straight and light tight. Extra pinholes are a nuisance! Use black tape to seal the possible light leaks. Align the enlarging paper carefully with the camera back.. Do not expose the enlarging paper to strong light. Open the black enlarging paper envelope and load the camera only in very dim or red light. Make sure the emulsion side (the lightly shining side in semi-matt paper) is towards the pinhole. It is a good idea to make a test exposure before the equinox.

The most difficult thing is to find a suitable location. You need a clear or almost clear horizon towards east for sunrise or towards west for sunset, with enough sky to the right or left to get the path of the Sun in the photo. The window has not to be at your or your student's home. I got help from a friend living in a high apartment house.

Make sure the camera is high enough to see the horizon and remember to level the camera. This is important especially if you cannot get a natural horizon (sea horizon) in the image.

Making the pinhole

Best material for the pinhole is a piece of a single-use aluminium pie pan. The pinhole must be round, thin-sided and of right diameter. The diameter is not very critical, though, if the main purpose is not to make as sharp pictures as possible. 0.3 – 0.5 mm is good for a small camera ("focal length", the distance from the pinhole to the imaging plane, about 50 – 120 mm) and 0.6 – 1.0 mm for a bigger camera (150 – 300 mm focal length).

Use a piece of cardboard under the aluminium sheet and push a needle very lightly against the sheet to get a very small circular hole or only a dent the sheet. Turn the sheet around and gently grind the foil thinner on the top of the dent using extra fine emery paper (grit 600). After that, pull the needle from this direction to make a small hole. Grind again a little on the other side and push the needle through the sheet to get a pinhole of required diameter. Turn the needle or sheet around to get a circular hole. Do not force the needle all the way through, if you want to get a smaller pinhole than the diameter of the needle. Make sure the hole does not have blurs on the underside due to bending of the aluminium, as this can cause reflections and extra diffraction (that is the reason for the grinding). Check the roundness of the hole with a magnifier. With a powerful measuring loupe, you can measure the diameter of the pinhole.

Scanning and processing a sunrise photo

End the exposure by covering the pinhole with black tape and take the camera to your scanner. Make sure that the lighting is very dim before opening the camera. Prescan the image. You probably will get a very faint result. Change the settings of the scanner software to darken the image and heighten the contrast to get a better image, then scan it and open it in a processing program.

Some hints on processing the scanned image in Photoshop Elements (I have the version 5):

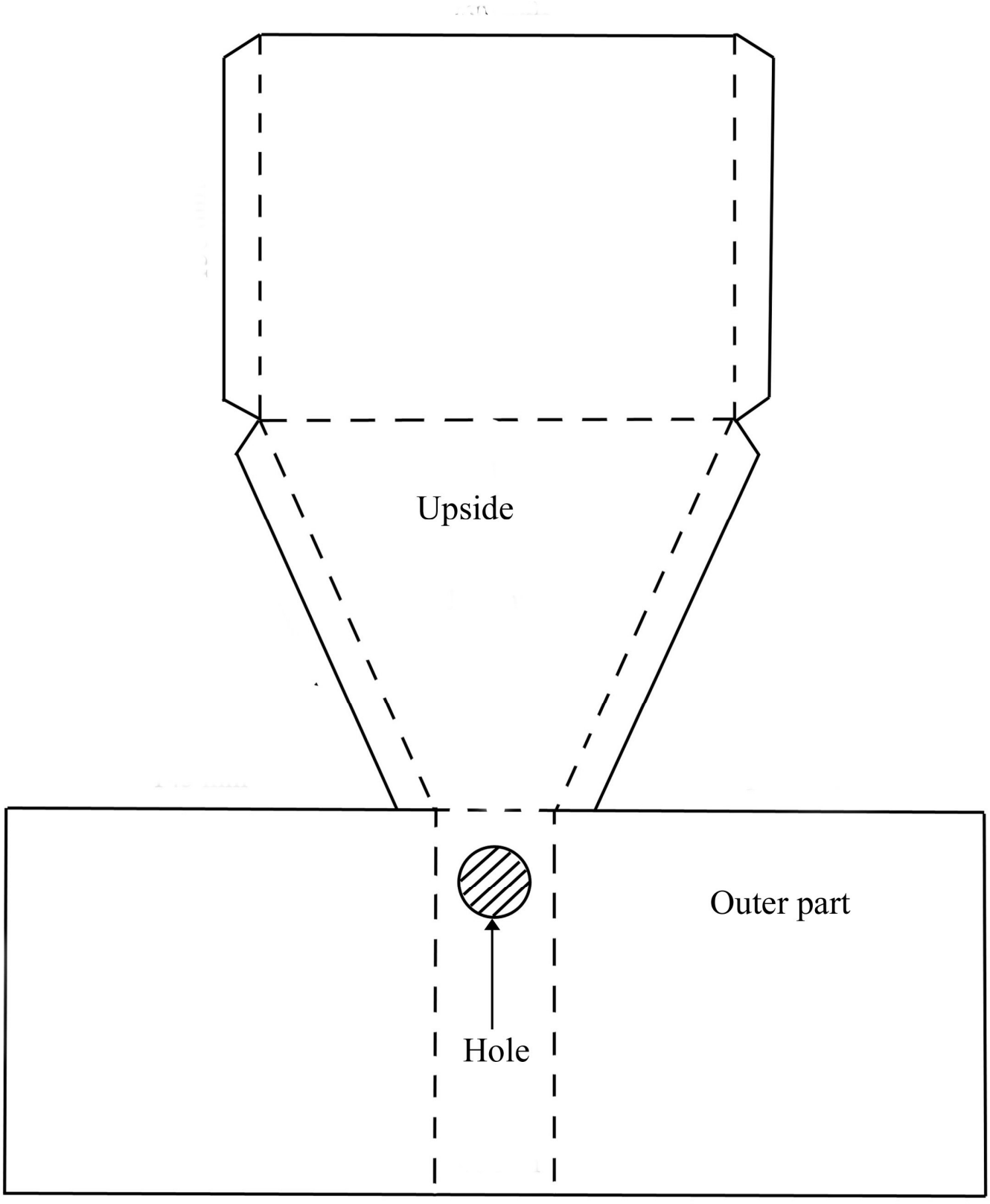
- the scanned image is mirror reversed. Flip it horizontally in image>rotate>flip horizontal
- to invert the negative to a positive select filter>adjustments>invert
- adjust the contrast in enhance>adjust lighting>levels or brightness/contrast
- if you do not like the colour, select enhance>adjust color>replace color and adjust fuzziness and hue until the colour satisfies you
- dust and scratches (I hope you avoided fingerprints on the emulsion!) you can retouch by cloning stamp or you can use filter>noise>dust and scratches. The latter makes the image softer, though. Retouching takes time, so it is important to handle the paper carefully to avoid dust, scratches and fingerprints in the first place. Newer versions of Photoshop Elements have better retouching functions.

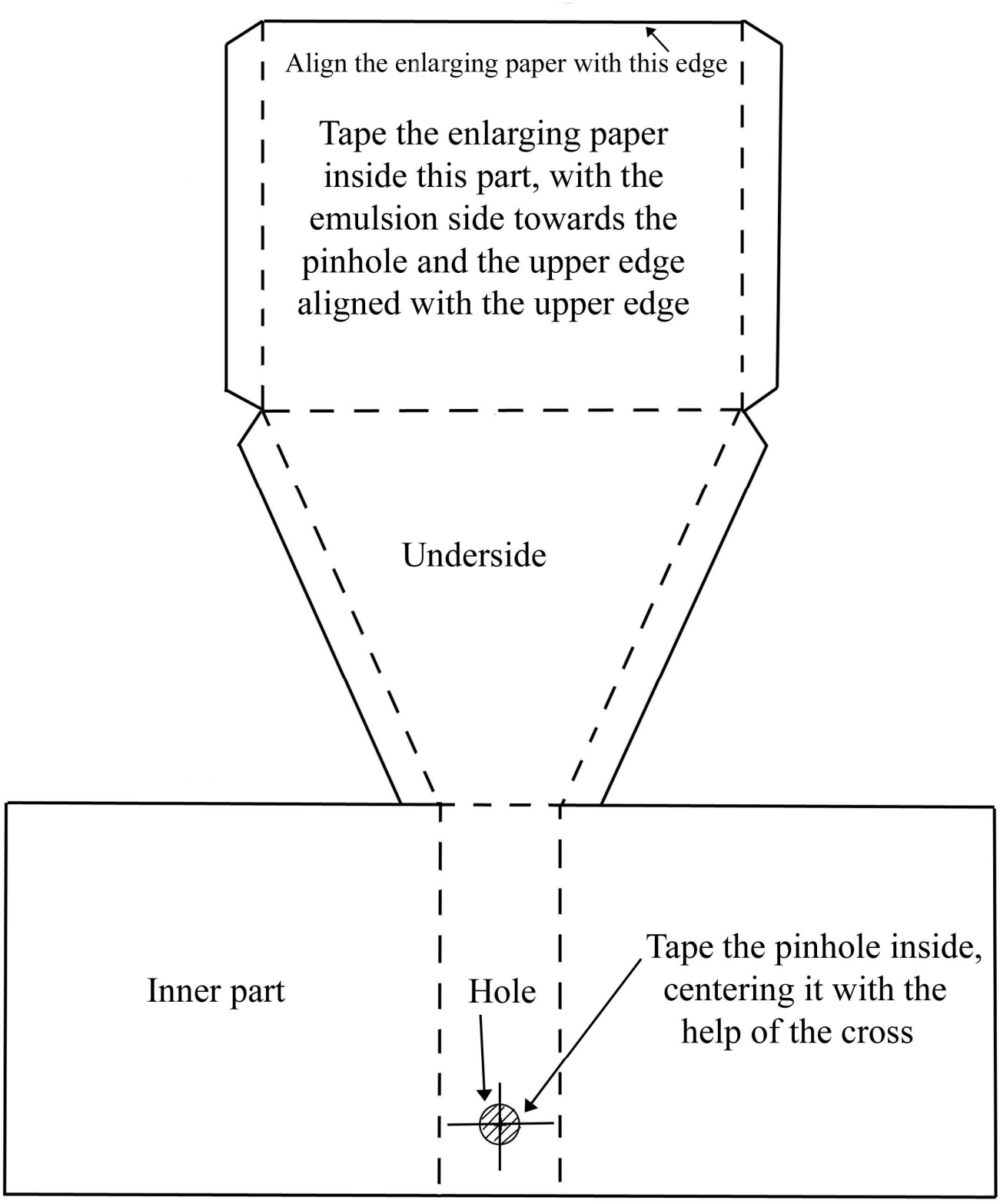
Other image processing programs have corresponding functions.

I have found that the students love to make a poster of the method, the images (their own and other images exposed in the project) and theory.

Drawings

See next two pages.


Upside
Outer part
Hole


Align the enlarging paper with this edge
Tape the enlarging paper inside this part, with the emulsion side towards the pinhole and the upper edge aligned with the upper edge
Underside
Inner part
Hole
Tape the pinhole inside, centering it with the help of the cross