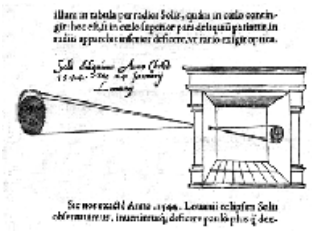
Alternative Photography Summer School

Room obscuras using a lens to view a 'transmitted' projection.



Information on making a lens based camera obscura projection using your front room and a simple lens obtainable from any 'budget' pound shop.

The advantage of this approach is the image is far brighter than the hole projection with a sheet held 1 meter away from the lens and viewed as a transmitted image (rather than projected on a far wall). As this uses a lens it requires focussing which is done by moving the sheet towards and away from the image.

You will need:

- A +1 dioptre lens from a pair of cheap reading glasses
- A cheap shower curtain (I hate to say it but the rubbishy Tesco £2 curtains are best)
- Blackout material. ie corrugated Cardboard, Rubble sacks, Lightproof material
- Optional. A template for an experiment mount (below)

What is it?

The camera obscura (latin for 'darkened room') was the earliest optical device and goes back over 2500 years. Originally images were projected through a small hole but from around 1500AD onwards, they began to use a lens.

What does it do?

This method will enable you to create a semi permanent camera obscura, which will inspire wonder in: your students, your kids, a waiting room or even just to create a unique space in your own home for contemplation or to impress your friends!

By simply blacking out a room, positioning the lens and hanging up the projection sheet 90cm away you will create a giant 2m x 2m inverted colour projection of the outside world 2400 years after Aristotle wrote "WΩW, that's CΩΩL".

It can help teach; history, science, art, optics and act as a definitive contrast to modern digital imaging and projection.

Installation

The obscura works most effectively in a blacked out, light tight room and works in both sunny and overcast conditions.

What room is best?

Any room with a window, which can be easily blacked out, will be fine. If this can be on the ground floor all the better as you can 'train' people to run around outside and hold up upside down lettering etc. Ideally the window shouldn't point South (towards the sun) but as it's usually cloudy don't worry too much!

How do I black a room out?

The room should be **completely** blacked out. This can be done using rubble sacks or corrugated cardboard cut to fit specific windows and fixed in position. A small cycle light may be useful to give people some vision upon entry and time for their eyes to adapt to the light.

Using a frame will take a bit of time to prepare but will mean your obscura can be ready to use at a few minutes notice. Corrugated cardboard from old packaging is usually free and easy to find.
Measure and cut it to size. Velcro pads will also make this quick to install and dismantle.
If you work at a school you could get the caretaker to do this (joke!)

How to install the lens and experiment mount.

After the room is blacked out, cut out an aperture slightly smaller than A4 (ensuring the hole lines up with the glass of the window).
If using the experiments plate template, print onto dark card and use a scalpel to cut out the apertures shown (in faint black lines). Tape the projection lens over the top circular aperture and fix the experiment mount over the A4 sized aperture in the blackout. Use a separate piece of black card to cover the apertures, which are not in use, (small Velcro pads work well).

Focussing

The projection sheet will need to be held or hung at the focussing point of a lens. When not in use the sheet can then be rolled up and hooked to the ceiling or detached. The point of focus of the lens will vary according to the distance of the subject in the image. Infinity will focuses at 100cm.
In the blacked out room, get a sheet of white paper and move it away from the lens until the image is in focus. Measure this distance as this will be the distance the projection sheet will need to hang (around 90cm). The projection sheet is then placed at this point and the image viewed behind *'through'* the sheet.

Hanging the projection sheet

When you have marked the focussing distance onto the ceiling. Fix the top edge of the screen to the ceiling. A wooden dowel (or broom handle) attached to the bottom of the screen can give a flatter image.

Condensation

In winter, condensation may appear between the lens and the window, which should be wiped off to keep a clear sharp image. Double glazed windows will be fine.

Creating a scenario.

Before you show the projection, cover the lens with some card and light the room with a cycle light to allow peoples eyes to get used to the dark. Whilst their eyes adjust you can tell them all: how light works, how stone age men possibly first noticed inverted images in their caves and how the gaps in a leaf canopy have been projecting the image of the crescent moon onto the forest floor for millions of years,,then, whip the card cover off the lens et voila! Instant wonder!

Various experiments

Each of the following experiment apertures should be used individually with all the other holes covered.

The Projection

The projected image is inverted (upside down) as it is in a camera or in the human eye, its our brain that makes it appear the right way round. Many times students have asked 'where is that' or 'where is the projector' never having seen a non digital projection before. Get a person to stand outside with the words 'I am upside down' written on a board upside down or just to walk around (a walkie-talkie to guide them around outside is useful here!).

Pinhole below lens

The hole below the lens can also be used (with the other apertures covered over) and will give a similar projection although a lot darker (only viewable in sunny conditions). A sheet of tracing paper on a picture mount can show the magnification and reduction of the image when moved closer or further away from the hole with the image remaining in focus (unlike lenses, pinholes stay in focus and have 'unlimited depth of field'). This sheet can also be held at an angle to the hole, so 'skewing' the image. If it is held in place you can draw the view like Canaletto!

Square hole experiment
Very simple, cut both a round and a similar sized square hole and ask what the difference in the projected image will be. It was Aristotle who first did this experiment 2400 years ago and was intrigued that a round sun projected through a square hole was still round.

Issac Newton and the shadow of a hair
A simple experiment, allowing the opportunity to replicate Isaac Newton's discovery of diffraction. If your obscura points towards the sun, on a sunny day hold a human hair in front of the pinhole projection. The resulting shadow will be larger than it should be due to diffraction. (You'll have to take my word for it, anything to incorporate the great man into a lesson!)

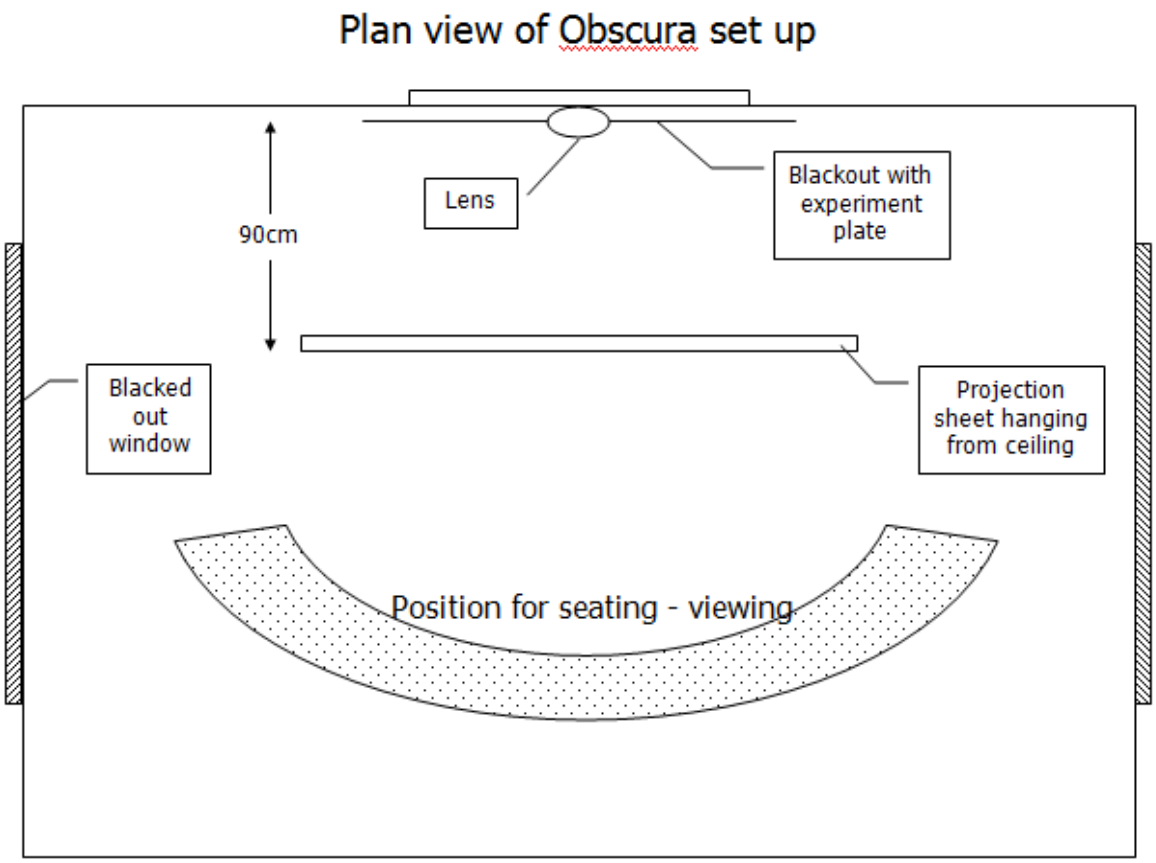

Image of a tomato on a blue background through a vertical slot

Slot below lens
A narrow 10cm long slot will project a stretched image of the outside world. If this is rotated 90 degrees (the second slot), an alternative plane is stretched.

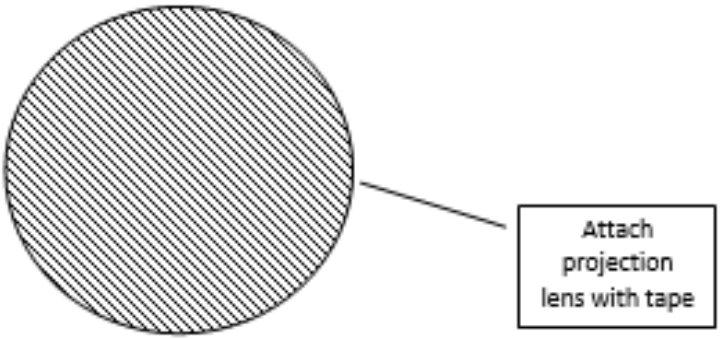
Concave mirrors
Several artists used a concave mirror to project an image of 'correct' perspective. Holding a concave (shaving) mirror a few feet from the large lensless hole will allow you to project the image onto the ceiling or wall of your classroom.

Digital v optical projections
Students are often unable to comprehend that it is simply a view of the outside world. Being used to digital projectors in schools and home makes the camera obscura projection of reality even more fascinating. A web cam positioned just below the lens can compare and contrast digital and optical projections of the same view.

Many other experiments can be done in a blacked out room using mirrors, prisms, lasers etc. The experiment plate contains a few but can easily be added to.



Template of experiment plate
(photocopy onto dark card)



Cut out shaded area on black or opaque card