## Camera Obscura

# The Beginning of Photography

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Maryland Institute College of Art 2002





Image from www.visuallee.com

## Experiment and see...

- Go into a very dark room on a bright day. Make a small hole in a window cover and look at the opposite wall. What do you see?
- Magic! There in full color and movement will be the world outside the window — upside down!
- This magic is explained by a simple law of the physical world. Light travels in a straight line and when some of the rays reflected from a bright subject pass through a small hole in thin material they do not scatter but cross and reform as an upside down image on a flat surface held parallel to the hole. This law of optics was known in ancient times.

## What is a Camera Obscura?

- The origin of the present day camera.
- In its simplest form it consisted of a darkened room or box with a small hole through one wall.
- Light rays could pass through the hole to transmit an inverted image of the scene outside the room onto a flat surface on its inside.

http://brightbytes.com/cosite/what.html

## History of the Camera Obscura

- The earliest mention of this type of device was by the Chinese philosopher Mo-Ti (5th century BC). He formally recorded the creation of an inverted image formed by light rays passing through a pinhole into a darkened room. He called this darkened room a "collecting place" or the "locked treasure room."
- Aristotle (384-322 BC) understood the optical principle of the camera obscura. He viewed the crescent shape of a partially eclipsed sun projected on the ground through the holes in a sieve, and the gaps between leaves of a plane tree.
- The Islamic scholar and scientist Alhazen (Abu Ali al-Hasan Ibn al-Haitham) (c.965 1039) gave a full account of the principle including experiments with five lanterns outside a room with a small hole.
- In 1490 Leonardo Da Vinci gave two clear descriptions of the camera obscura in his notebooks. Many of the first camera obscuras were large rooms like that illustrated by the Dutch scientist Reinerus Gemma-Frisius in 1544 for use in observing a solar eclipse.
- The image quality was improved with the addition of a convex lens into the aperture in the 16th century and the later addition of a mirror to reflect the image down onto a viewing surface. Giovanni Battista Della Porta in his 1558 book Magiae Naturalis recommended the use of this device as an aid for drawing for artists.
- The term "camera obscura" was first used by the German astronomer Johannes Kepler in the early 17th century. He used it for astronomical applications and had a portable tent camera for surveying in Upper Austria.

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# The development of the camera obscura took two tracks...



## Stationary

- The other track became the camera obscura room, a combination of education and entertainment.
- In the 19th century, with improved lenses that could cast larger and sharper images, the camera obscura flourished at the seaside and in areas of scenic beauty.



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## Camera Obscuras to Visit...

- Some camera obscura have been built as tourist attractions.
- They often take the form of a large chamber within a high building that can be darkened so that a 'live' panorama of the world outside is projected onto a horizontal surface through a rotating lens.
- Although few now survive, examples can be found at many locations worldwide.

#### A photo of the Camera Obscura in San Francisco. This Camera Obscura is located at the Cliff House on the Pacific ocean.

Credit to Jacob Appelbaum



### Freestanding room-sized camera obscura outside Hanes Art Center at the University of North Carolina at Chapel Hill Credit to Seth Ilys





## Portable

- One of these led to the portable box device that was a drawing tool.
- In the 17th and 18th century many artists were aided by the use of the camera obscura. Jan Vermeer, Canaletto, Guardi, and Paul Sandby are representative of this group.
- By the beginning of the 19th century the camera obscura was ready with little or no modification to accept a sheet of light sensitive material to become the photographic camera.



## Pinhole cameras

- A pinhole camera is a type of camera obscura, as are all photographic cameras.
- The pinhole camera starts with a enclosed container (AKA the "dark room") with a very small opening(aperture) to let in the light. It is therefore a camera obscura.
- Cameras that use an actual pinhole size aperture are used to expose photographic film or paper but have limited use as viewing or drawing devices because the light that the pinhole admits is very dim and the image would be very hard to see.
- Most camera obscuras are made with lenses in the aperture since this makes the image much brighter and sharper.
- Room sized camera obscuras are sometimes made with lensless apertures but these openings are much larger than a pinhole. (An opening about the size of a US quarter can work well in some rooms.)

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## **Pinhole Basics**



## Pinhole How To

- Don't be misled by the size of the fisherman; a pinhole camera can be as large as he suggests, but most are about the size of a shoebox.
- Exposure time is dependent on the size of the camera (distance from lens to film), the size of the pin hole, the sensitivity of the emulsion, and the brightness of the ambient light.
- The average pin hole is .02 inch. The diameter of the average pin shaft is .025 inch. A small pin hole, (just the tip of a pin) is likely to be .015 inch. A hole of about .02 of an inch will require an exposure of about 1 minute using RC Glossy photographic paper as a negative, but if the pin hole is a little smaller (.015 of an inch) about 2 minutes is necessary.
- A smaller hole is better because the smaller the hole the longer the exposure should be; the longer the time, the less problematic a mis-timing of a few seconds will be.
- To attain greater precision, figure the lens's f/stop. You can do this by dividing the distance of the hole to the emulsion by the diameter of the pin hole. The dividend is the f/stop. Knowing the f/stop (usually around f/200), use a hand held lightmeter to take a light reading, and calculate the exposure time.

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## Konica of Japan's Simple Pinhole Camera



## Make your own pinhole camera...

- Using a pin, poke a small hole in the end of an empty film canister & cover the hole with a piece of opaque tape.
- Secure a small piece of photographic paper inside the canister in the darkroom.
- Take your canister to your location and place it on a flat surface.
- Remove the tape without moving the canister to create your exposure & after 1-2 minutes carefully place the tape back over the pinhole.
- The canister can now be brought back into the darkroom, opened and the paper developed.