CAMERA OBSCURA

Historically, the Camera Obscura consisted of a well sealed box with a pinhole on the front wall. The Camera Obscura has been used in both artistic and scientific contexts in the past. Artists known to have used the Camera Obscura in their work include, among others, Da Vinci, Alberti, and Vermeer. The architect Bruneleschi developed his theory of perspective aided in part by the Camera Obscura.

The Optical Function of the Pinhole

Allows light falling on it to pass through unobstructed, and stops light that falls outside the pinhole area.

The Formation of an Inverted Image on the Screen behind the Pinhole

The figure “Pinhole graphic” shows how an image of an erect vertical arrow object is formed by a pinhole on an opaque screen behind the pinhole. The red lines emerging from the object represent light rays which, according to geometrical optics, travel in straight lines on their way to the screen. Thus, light rays emerging from the tip of the arrow **(A)** pass through the pinhole arriving at the screen at **A’** and form an image of the tip there. Light rays emerging from the bottom **(B)** of the arrow object pass through the pinhole and reach the screen at **B’** forming an image of the bottom of the arrow there. It is clear that the image formed on the screen is inverted relative to the orientation of the object arrow.

The Pinhole as a Camera

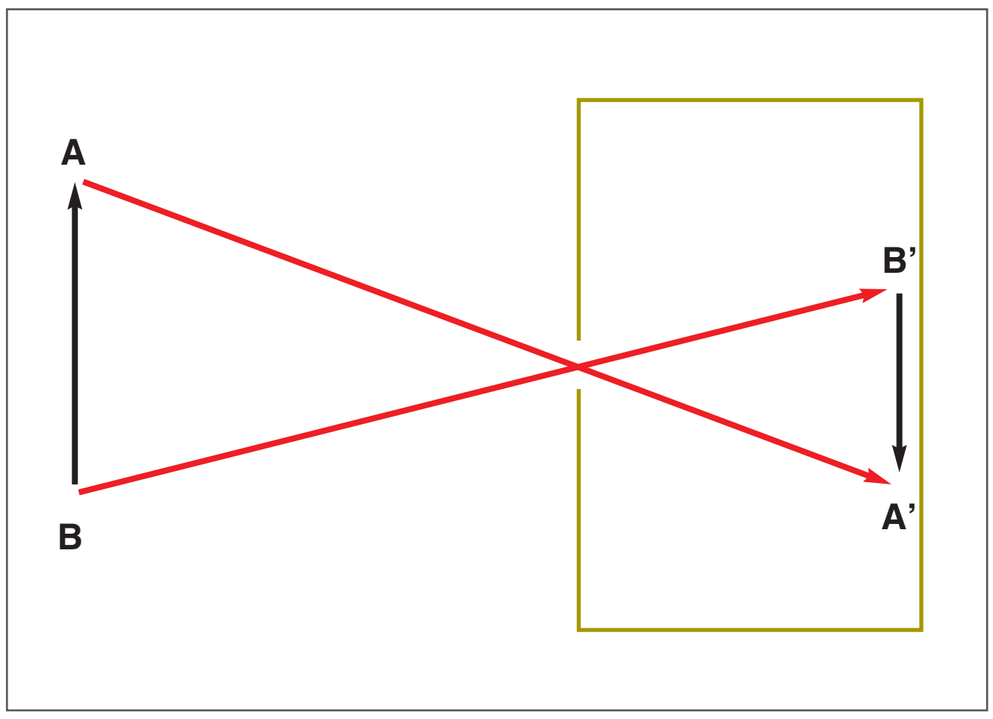
A camera is a device used to record images of objects on photographic film. By replacing the screen behind the pinhole with photographic film, one can record a permanent image of the object on the film. Such a pinhole camera is referred to as a CAMERA OBSCURA – literally DARK ROOM. Note that there are no lenses involved in this type of camera. These were, historically, the first devices used to record images on a screen (film). Modern cameras use one or more lenses to enhance image quality.

Conclusions

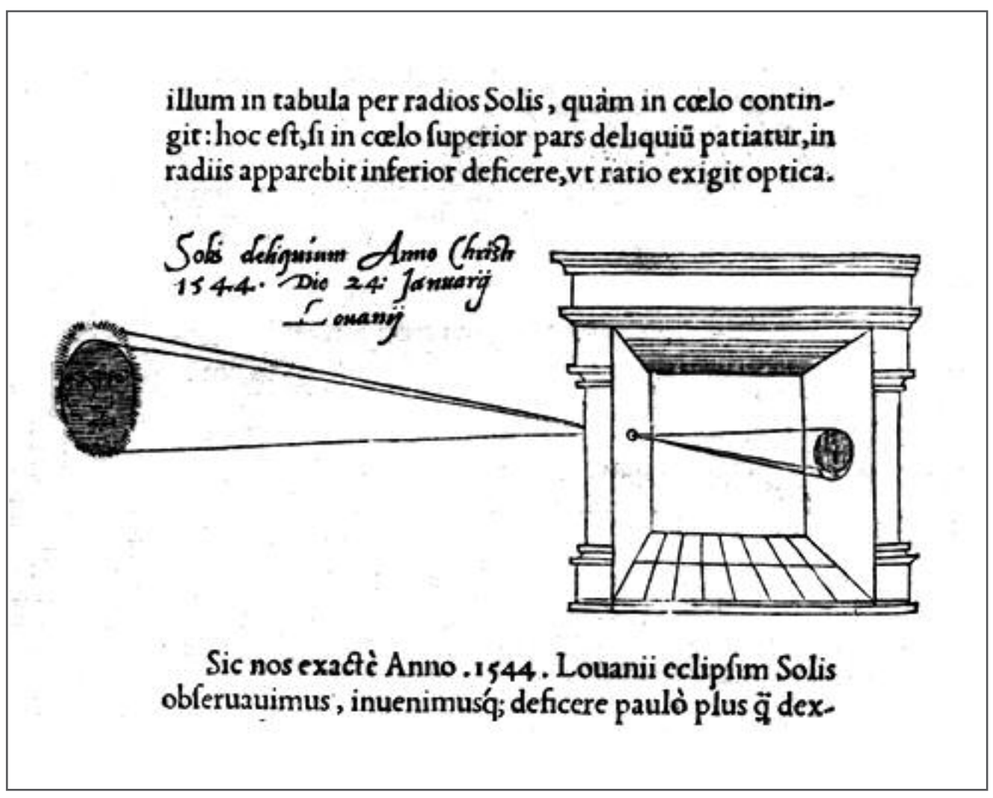
Most art departments, for example the one at UB, have at least one Camera Obscura, and students use them both in their art work, and to study image formation and perspective. If you wish to see a truly spectacular Camera Obscura, journey to the Cliff House in San Francisco. A Camera Obscura is located at the back (outside the truly wonderful restaurant there) and allows one to view magnificent images of rolling waves projected onto a bowl-shaped surface on the floor. That is where I (Professor Michael Ram) developed my excitement over the Camera Obscura and decided to have one built at UB for use by our students.

Resources

The most comprehensive book on the subject is “Pinhole Photography” by Eric Renner, Focal Press, 2000.



Pinhole graphic



Camera Obscura, by Reinerus Gemma-Frisius, 1544,
from “The Origins of Photography” by H.Gernsheim,
Milan: Electa, 1981. New York: Thames and Hudson, 1982.

"Reinerus Gemma-Frisius, observed an eclipse of the sun at Louvain on January 24, 1544, and later he used this illustration of the event in his book “De Radio Astronomica et Geometrica”, 1545. It is thought to be the first published illustration of a camera obscura..." J.H. Hammond, “The Camera Obscura, A Chronicle”, Adam Hilger Limited, Bristol, 1981