CS4670 / 5670: Computer Vision
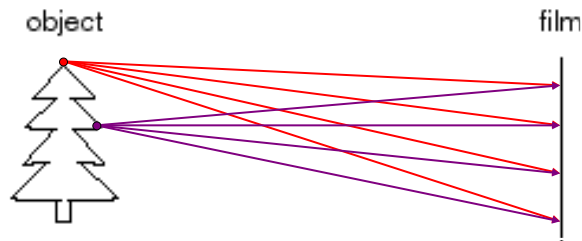Noah Snavely

Lecture 12: Cameras
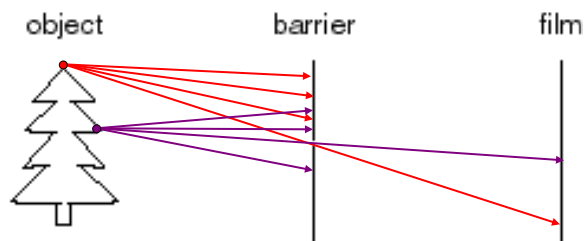

Source: S. Lazebnik

Reading

- Szeliski 2.1.3-2.1.6
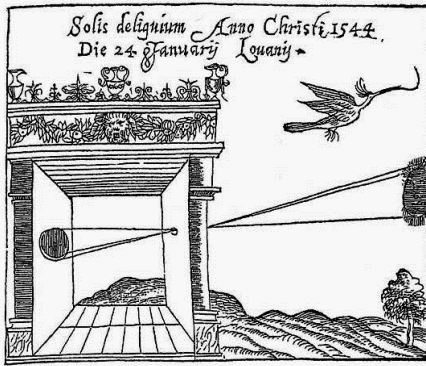
Image formation

- Let's design a camera
  - Idea 1: put a piece of film in front of an object
  - Do we get a reasonable image?

Pinhole camera

- Add a barrier to block off most of the rays
  - This reduces blurring
  - The opening known as the **aperture**
  - How does this transform the image?

Camera Obscura

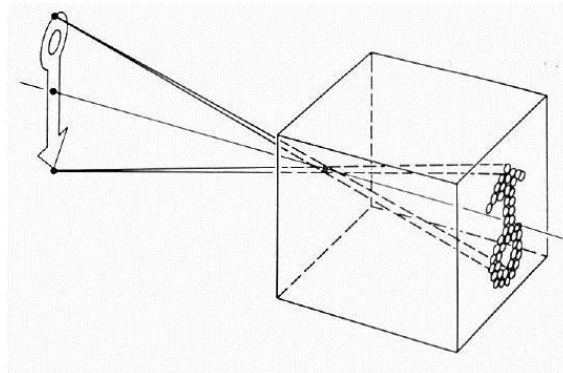Solis deliquium Anno Christi 1544.
Die 24 oJanuary Louanij

Gemma Frisius, 1558

- Basic principle known to Mozi (470-390 BC), Aristotle (384-322 BC)
- Drawing aid for artists: described by Leonardo da Vinci (1452-1519)

Source: A. Efros

Camera Obscura

Home-made pinhole camera

Why so
blurry?

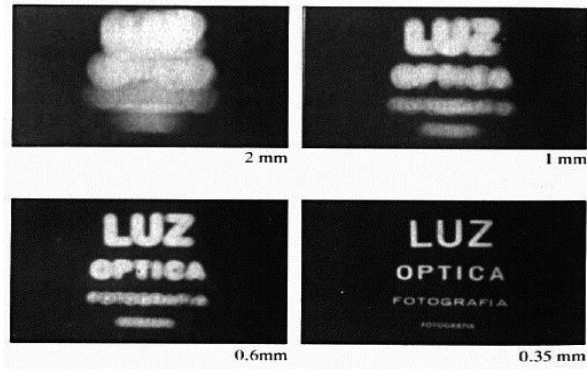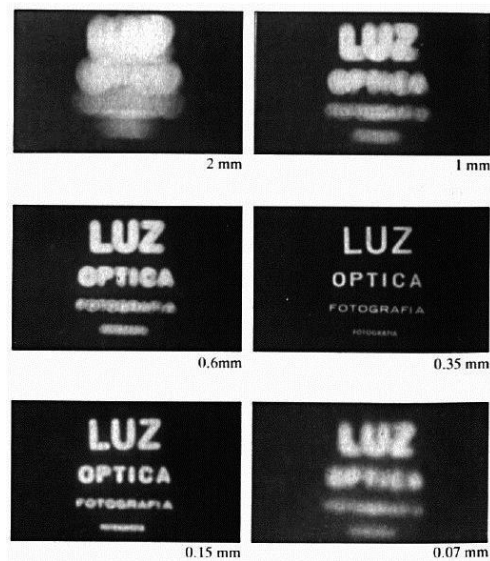http://www.debevec.org/Pinhole/

Pinhole photography

Justin Quinnell, The Clifton Suspension Bridge. December 17th 2007 - June 21st 2008
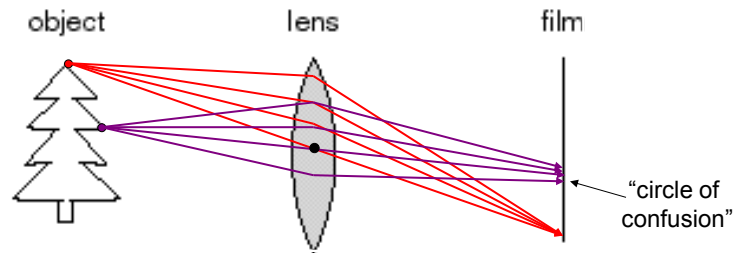*6-month* **exposure**

Shrinking the aperture

- Why not make the aperture as small as possible?
  - Less light gets through
  - *Diffraction* effects...

Shrinking the aperture

Adding a lens

object lens film

"circle of confusion"

- A lens focuses light onto the film
  - There is a specific distance at which objects are "in focus"
    - other points project to a "circle of confusion" in the image
  - Changing the shape of the lens changes this distance