

# Computer Science E-7

## Exposing Digital Photography

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Lecture 4: Exposure (continued)  
September 28, 2009

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# Shutter Speed

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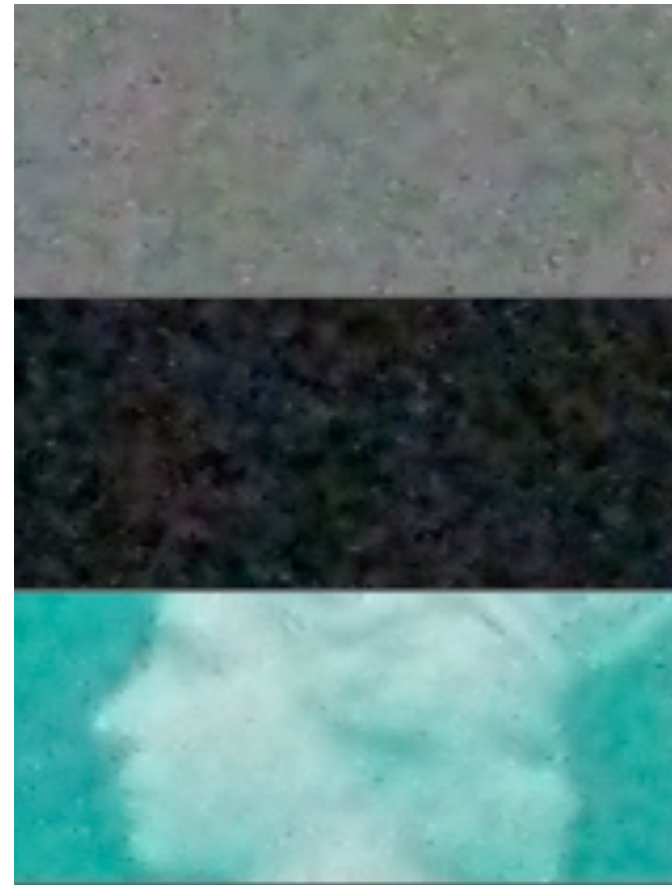
Stopping motion

Photo by Dan Armendariz, 2004  
1/1250s, ISO 200, f/2.8





ISO 100

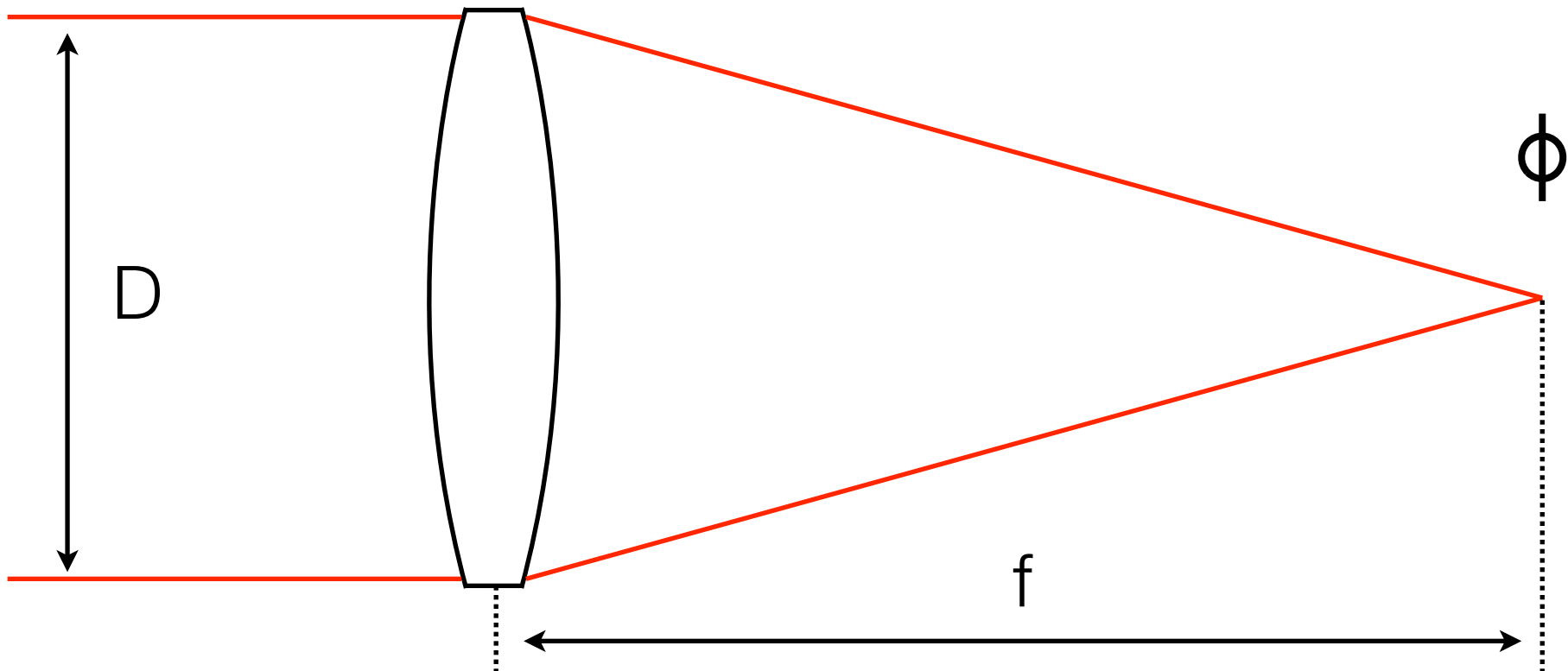


ISO 1600

Images from <http://www.dpreview.com/reviews/canonsx100is/page6.asp>

Sensitivity (ISO)

Compact cameras



Aperture

F-number =  $f/D$

Exposure

Metering

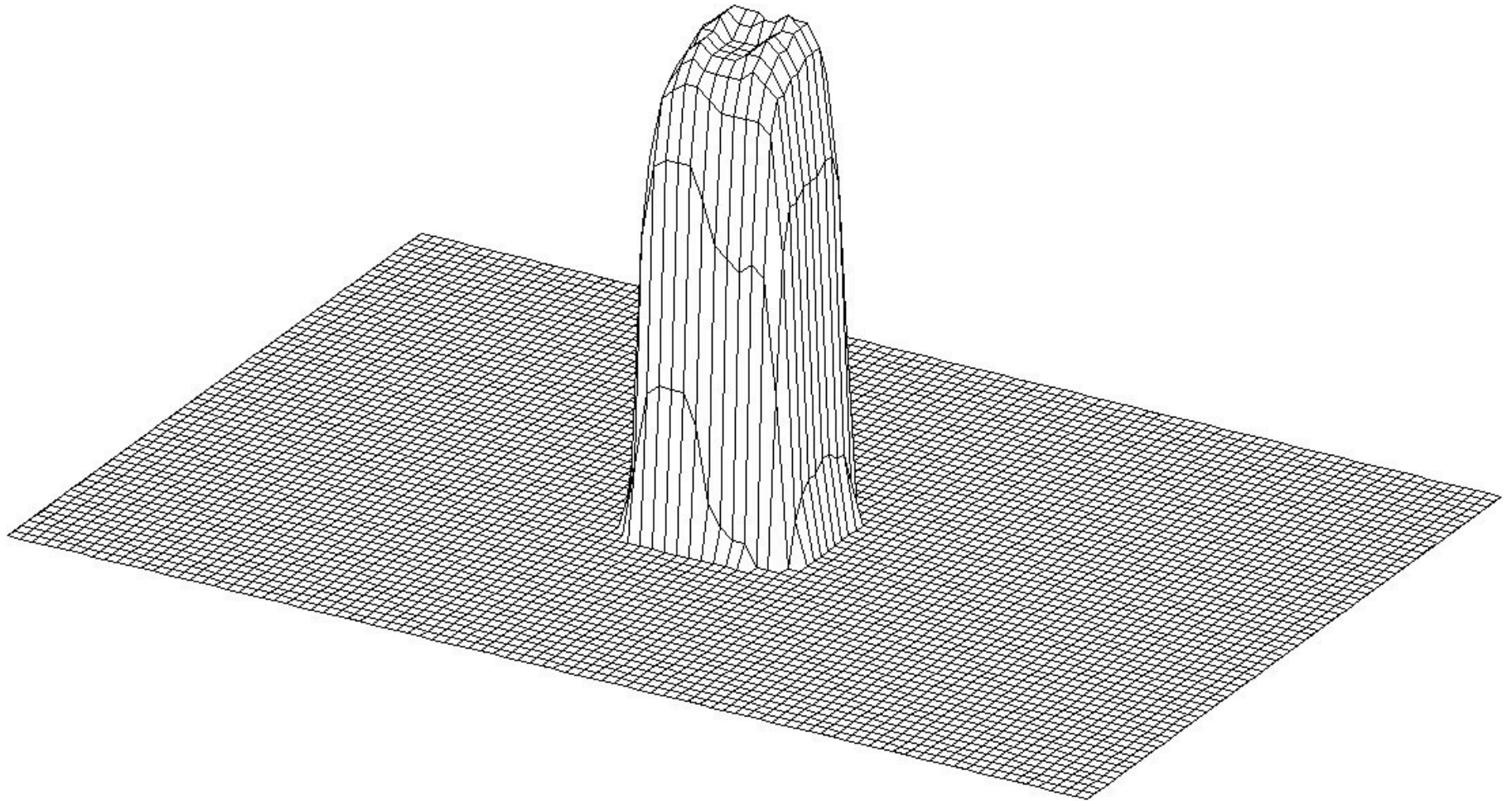


Image from <http://www.imaging-resource.com/PRODS/E40D/E40DA5.HTM>

Metering

Spot



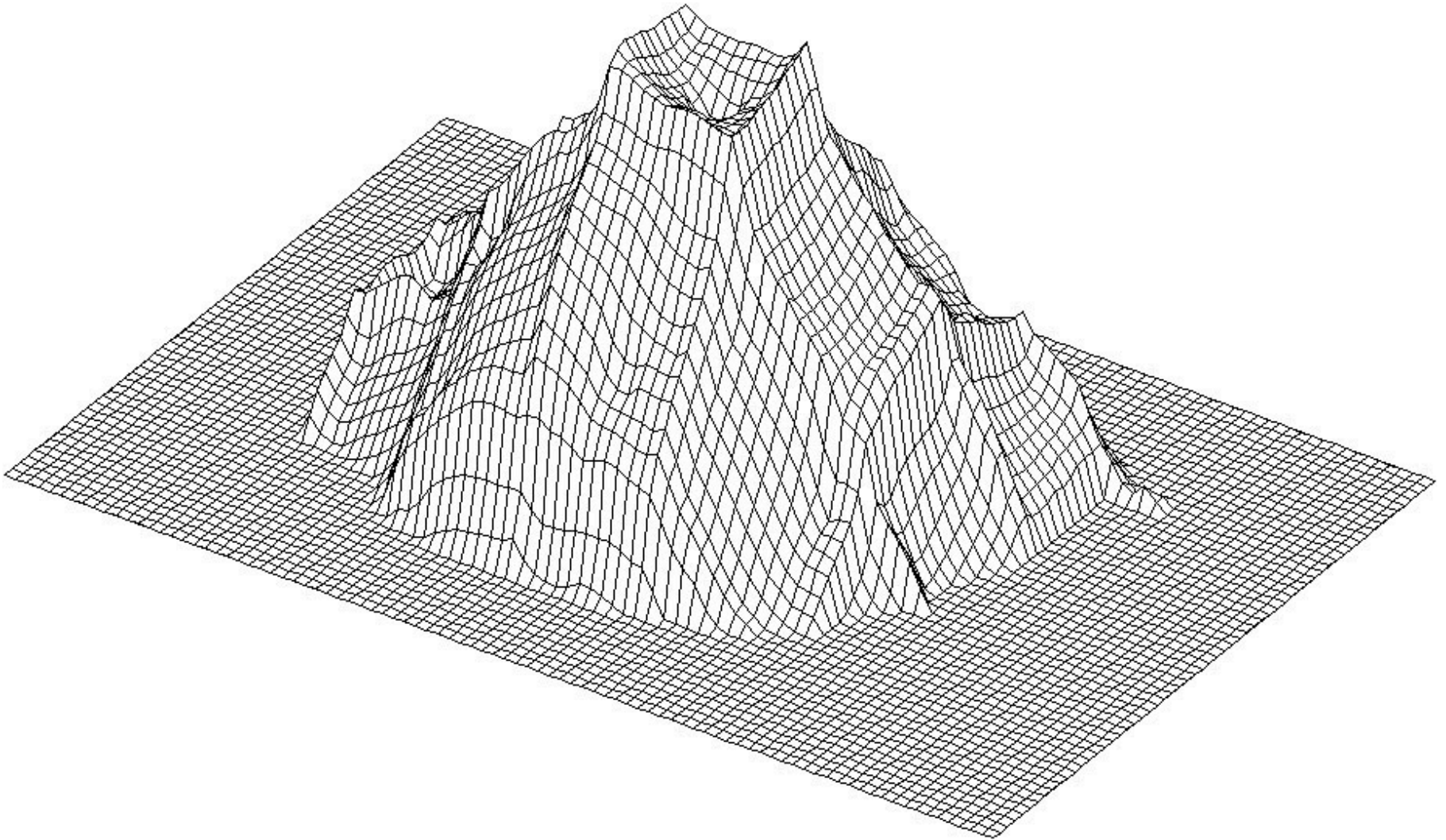


Image from <http://www.imaging-resource.com/PRODS/E40D/E40DA5.HTM>

Metering

Center-weighted



1/2500s, ISO 400, f/5.6

Photo by Dan Armendariz, 2007

# Metering

## Zone Metering





1/800s, ISO 100, f/4.5, +0.7ev

Photo by Dan Armendariz, 2007

# Metering

## Exposure Compensation





Left: 1/80s, ISO 400, f/2.8, 0ev. Right: 1/80s, ISO 800, f/2.5, +1.3ev



Photos by Dan Armendariz, 2005

# Metering

# Positive Exposure Compensation



Left: 611s, ISO 100, f/256, 0ev. Right: 611s, ISO 100, f/256, -2.0ev corrected in software

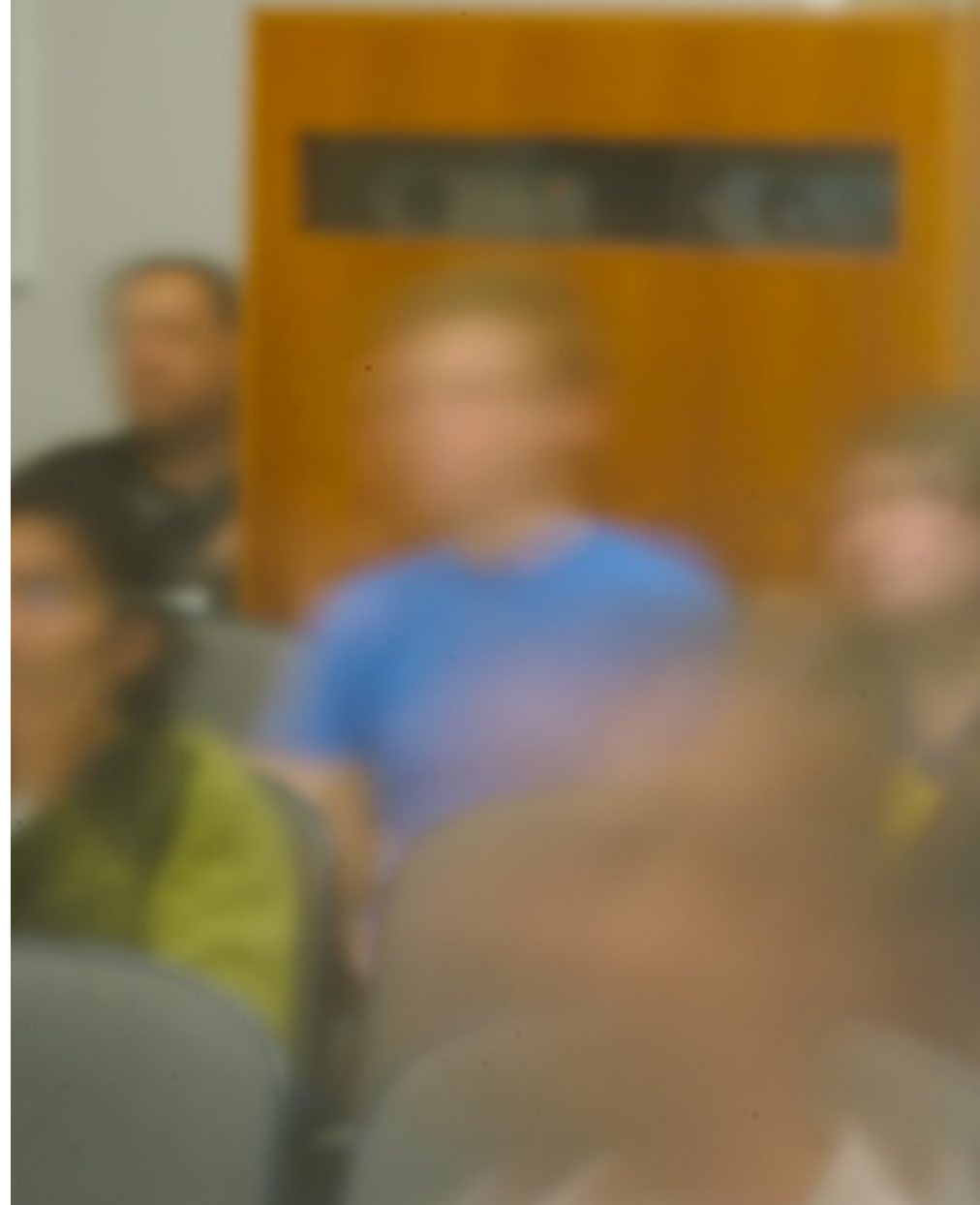


Photo by Dan Armendariz, 2008

# Metering

## Negative Exposure Compensation



Image from <http://www.dpreview.com/reviews/nikond40x/page6.asp>

# Metering

## Camera Modes





Image from <http://www.dpreview.com/reviews/CanonEOS5D/page6.asp>

# Metering

## Camera Modes

- Amount of available light
- Shutter speed
- Sensitivity (ISO)
- Aperture

Exposure

The Big 4



Left: 1/320s, ISO 800, f/2.5, 0ev Right: 1/40s, ISO 1600, f/3.5, 0ev

Photos by Dan Armendariz, 2005

# Exposure

## Natural Light



Image from <http://www.dpreview.com/previews/nikond300/page5.asp>

Exposure

Increasing Available Light



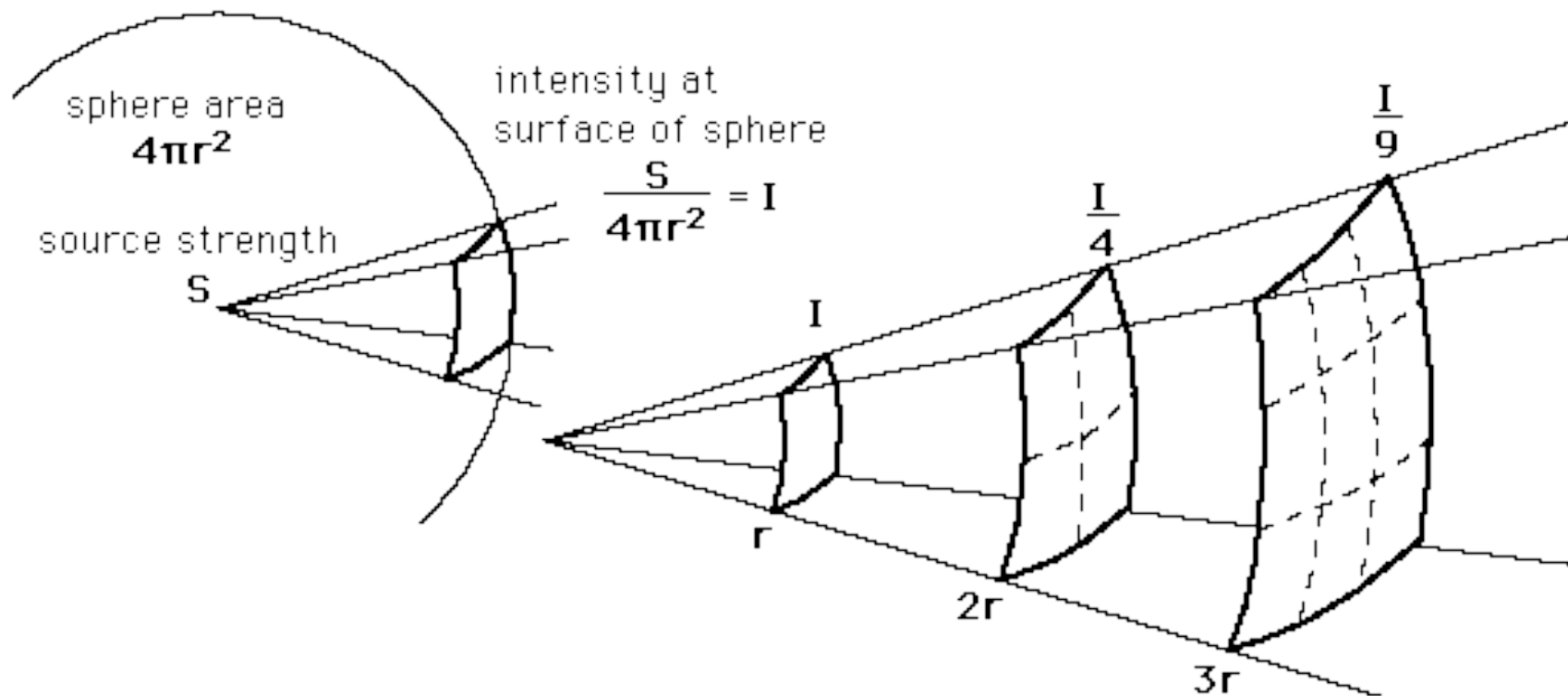


Image from [http://imagine.gsfc.nasa.gov/docs/science/try\\_l2/supernovae.html](http://imagine.gsfc.nasa.gov/docs/science/try_l2/supernovae.html)

Light

Inverse Square Law

Guide Number = Distance x F-number

Flash

Guide Number

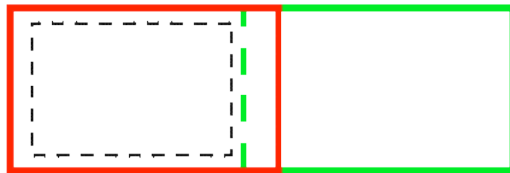


Fig. 1

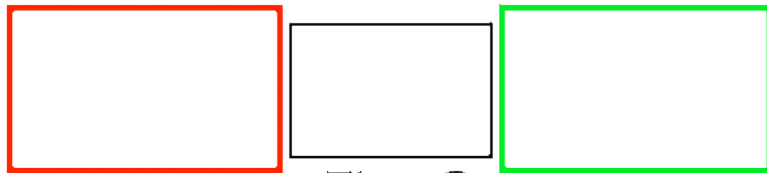


Fig. 2

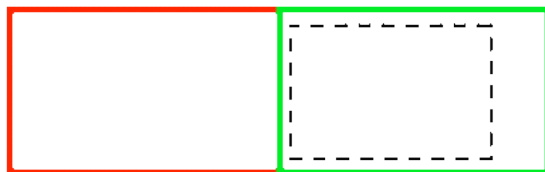


Fig. 3

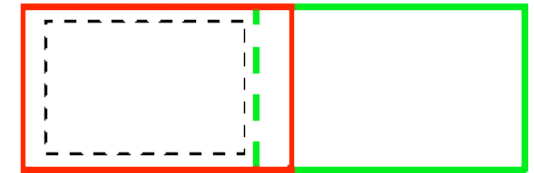


Fig. 1

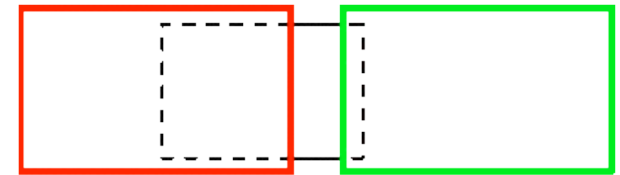


Fig. 2

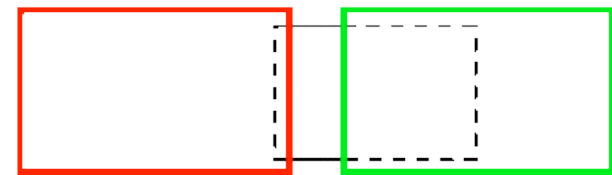


Fig. 3

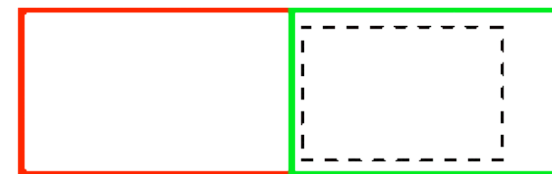


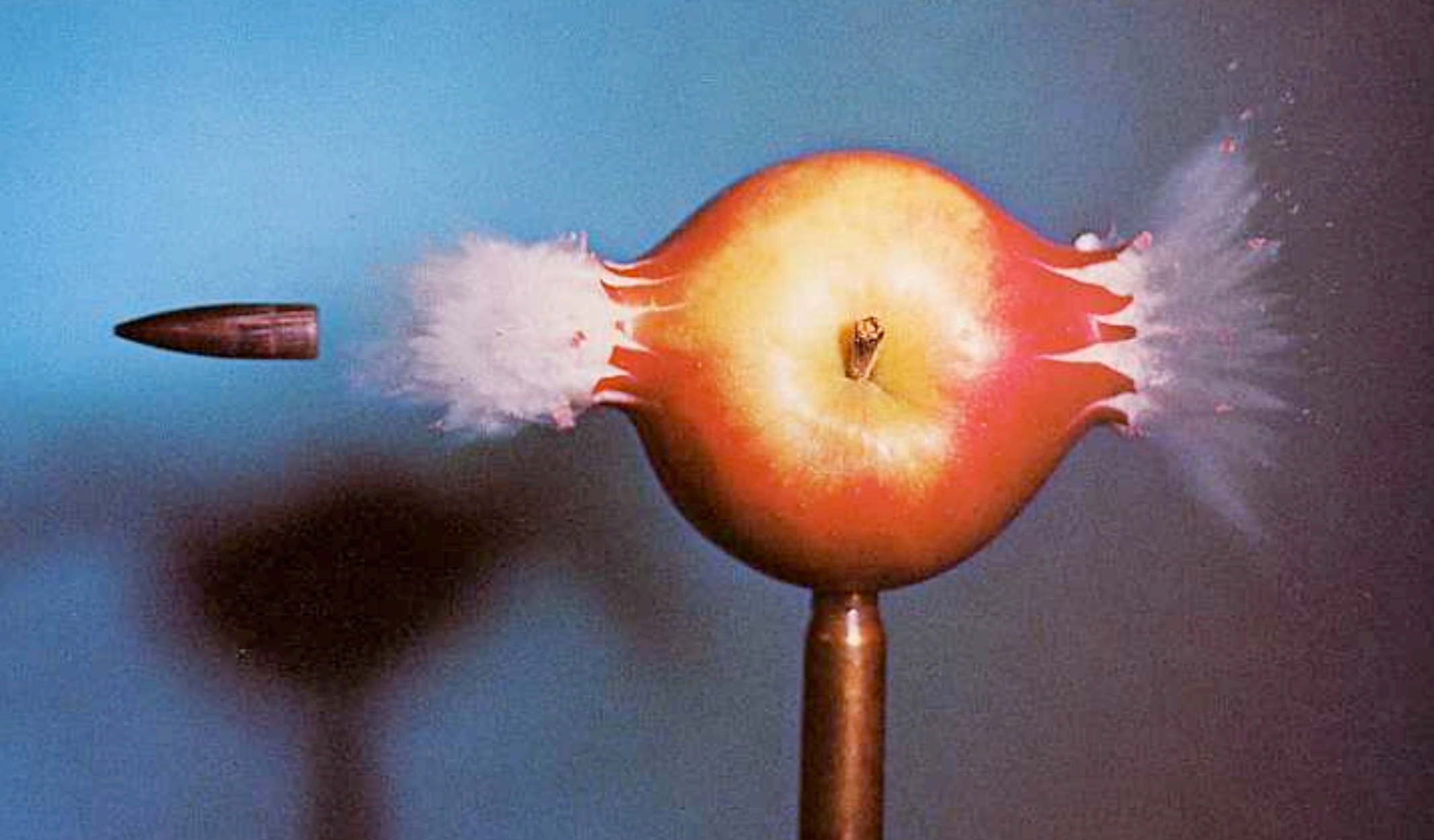
Fig. 4

Left: Slow shutter speed (entire sensor exposed). Right: Fast shutter speed.

Images from [http://en.wikipedia.org/wiki/Focal\\_plane\\_shutter](http://en.wikipedia.org/wiki/Focal_plane_shutter)

# Flash

## Focal Plane Shutter Re-visited



*0.30 Bullet Piercing an Apple*

©1964, Dr. Harold Eugene Edgerton

Flash

Strobes Are Quick





2s, ISO 100, f/2.8, 0ev

Photo by Dan Armendariz, 2002

# When Flash Goes Wrong

## Red Eye

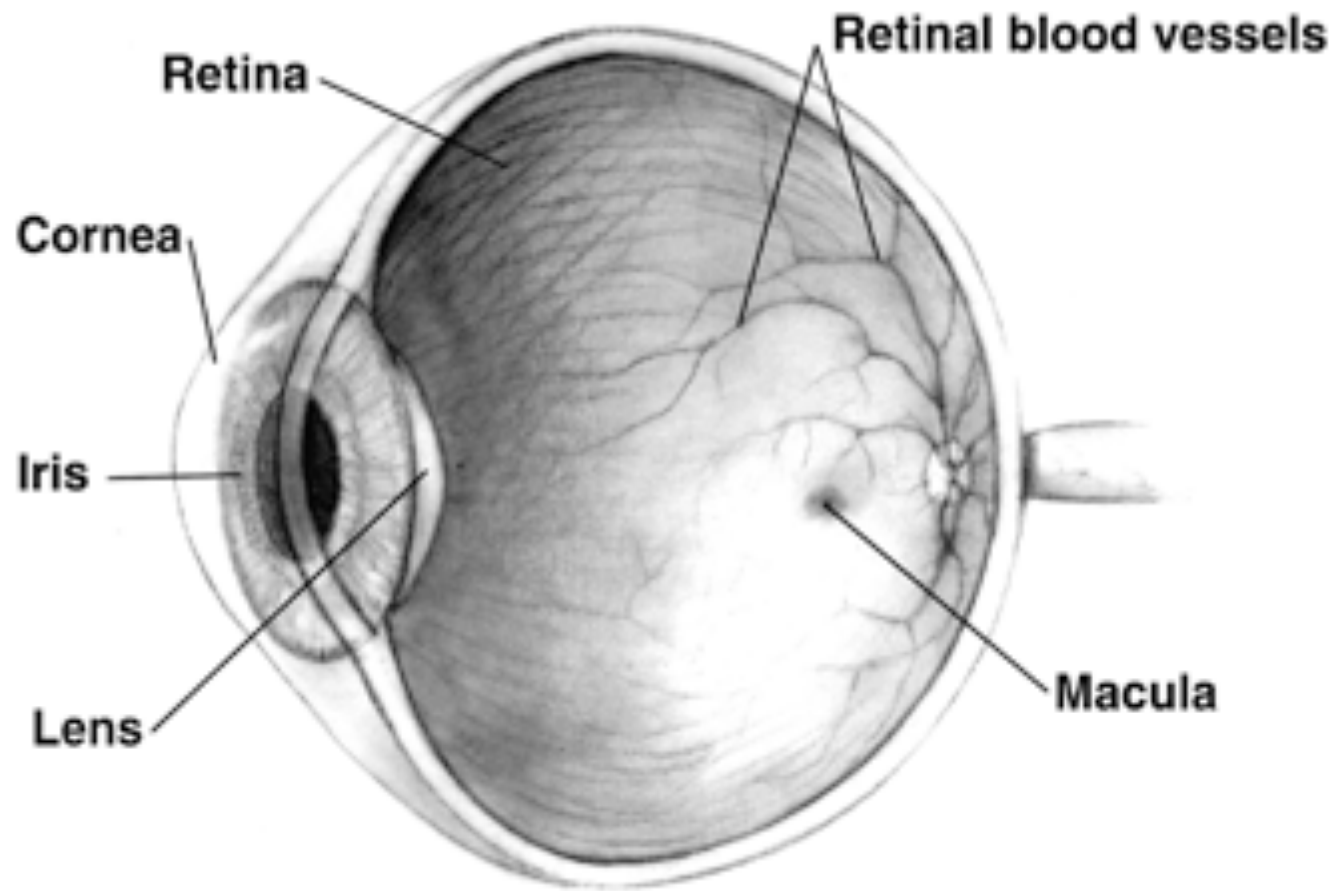


Image from <http://en.wikipedia.org/wiki/Eye>

# When Flash Goes Wrong

## Red Eye

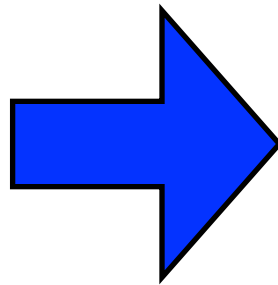


2s, ISO 100, f/2.8, 0ev

Photo by Dan Armendariz, 2002

# When Flash Goes Wrong

## Shadows



Left image: <http://www.dpreview.com/reviews/CanonEOS30D/page5.asp>, Right image: <http://reallyrightstuff.com/flash/04.html>

# When Flash Goes Wrong

## Shadows





2s, ISO 100, f/2.8, 0ev

Photo by Dan Armendariz, 2002

# When Flash Goes Wrong

Motion Blur

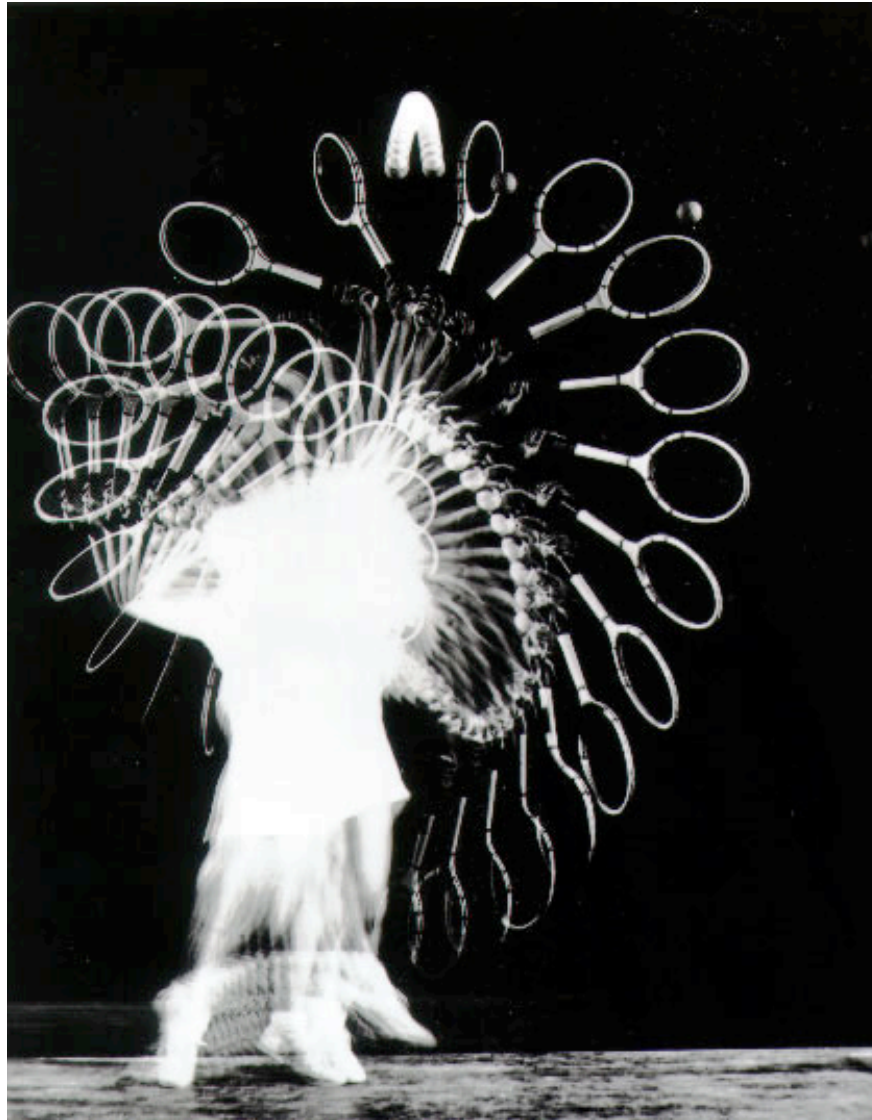


Left: Front-curtain sync. Right: Rear-curtain (2nd curtain) sync

Images from <http://www.nikondigitutor.com/eng/d70/select.php?menu=1&sub=b11&num=4>

# Flash

## Curtain Sync



*Gussie Moran*

©1949, Dr. Harold Eugene Edgerton

Flash

Stroboscopes





Image from <http://www.theothermartintaylor.com/moveabletype/archives/cameras/000156.html>

# Flash

## Old Flash Units on DSLRs



1/8000s, ISO 1600, f/4.5, 0ev

Photo by Dan Armendariz, 2007

# Flash

(Lack of) Fill Flash





1/250s, ISO 100, f/4.5, 0ev

Photo by Dan Armendariz, 2007

# Flash

## Fill Flash



1/250s, ISO 100, f/11, 0ev

Photo by Dan Armendariz, 2007

Flash

Fill Flash



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