

Yousuf Karsh,
Winston Churchill,
1941



Yousuf Karsh,
Audrey Hepburn
1956



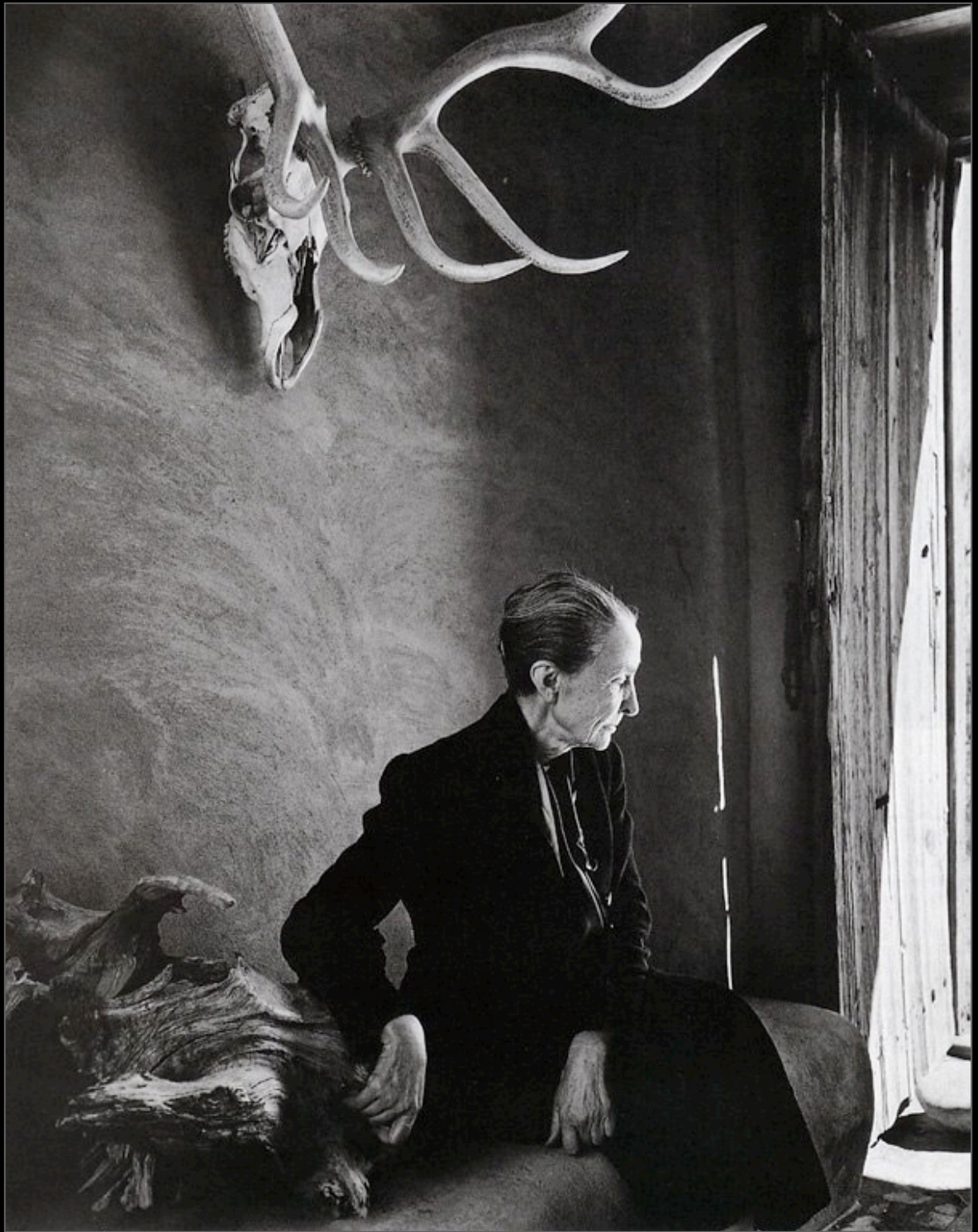


Yousuf Karsh,
Peter Lorre,
1946

Photography in available light

- ◆ challenging
- ◆ worthwhile
- ◆ requires patience and luck
- ◆ always carry your camera

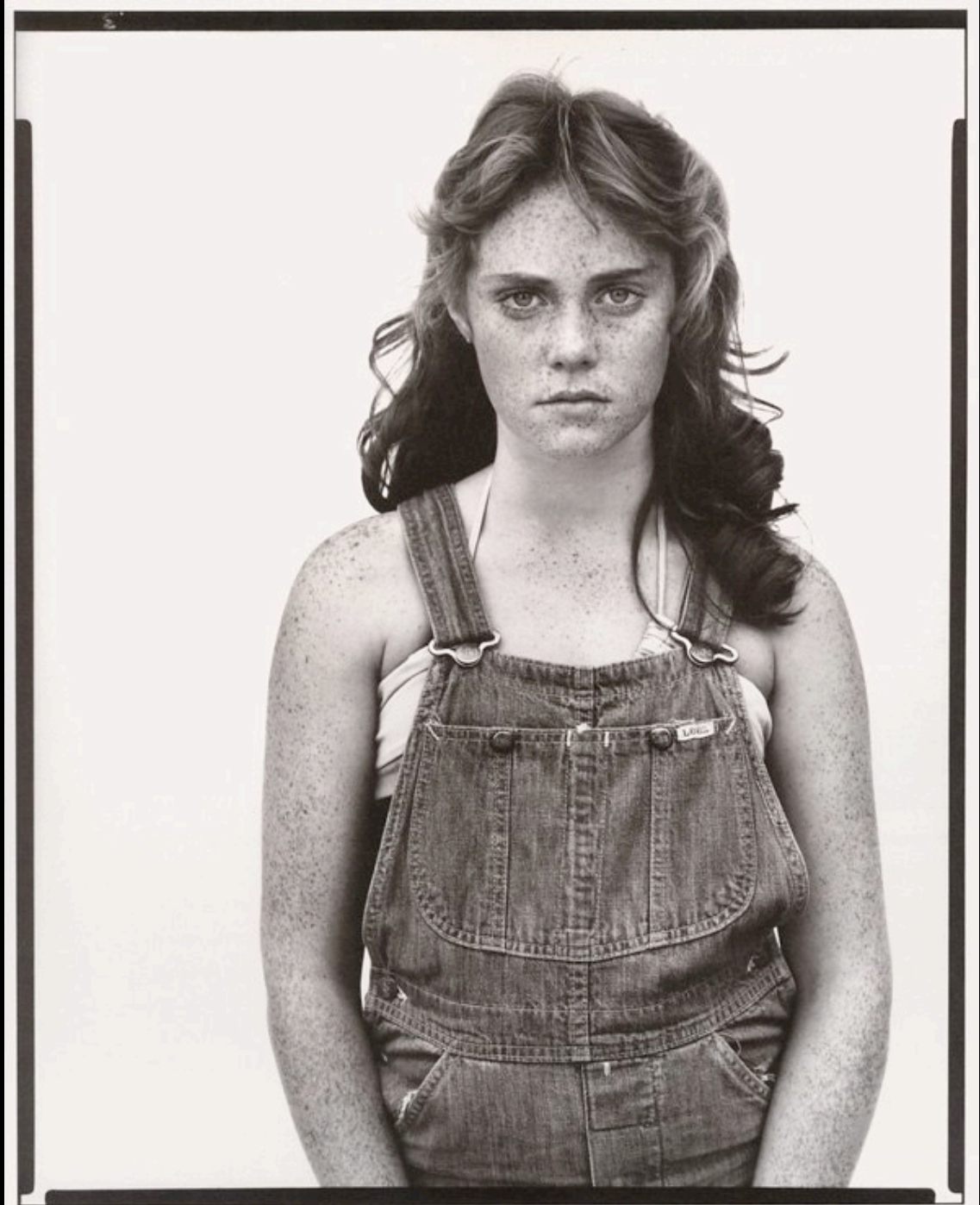
Yousuf Karsh,
Georgia O'Keeffe,
1956





Avedon working outdoors

Richard Avedon,
Sandra Bennett,
1980



SANDRA BENNETT, TWELVE YEAR OLD, ROCKY FORD, COLORADO, AUGUST 23, 1980





Caravaggio, The Calling of St. Matthew, 1599



Rembrandt, Belshazzar's Feast, 1599

Studio lighting

spotlight with
reflective umbrella

floodlight

zebra board

lights with
diffusers



(Kodak)

spotlight

strobe

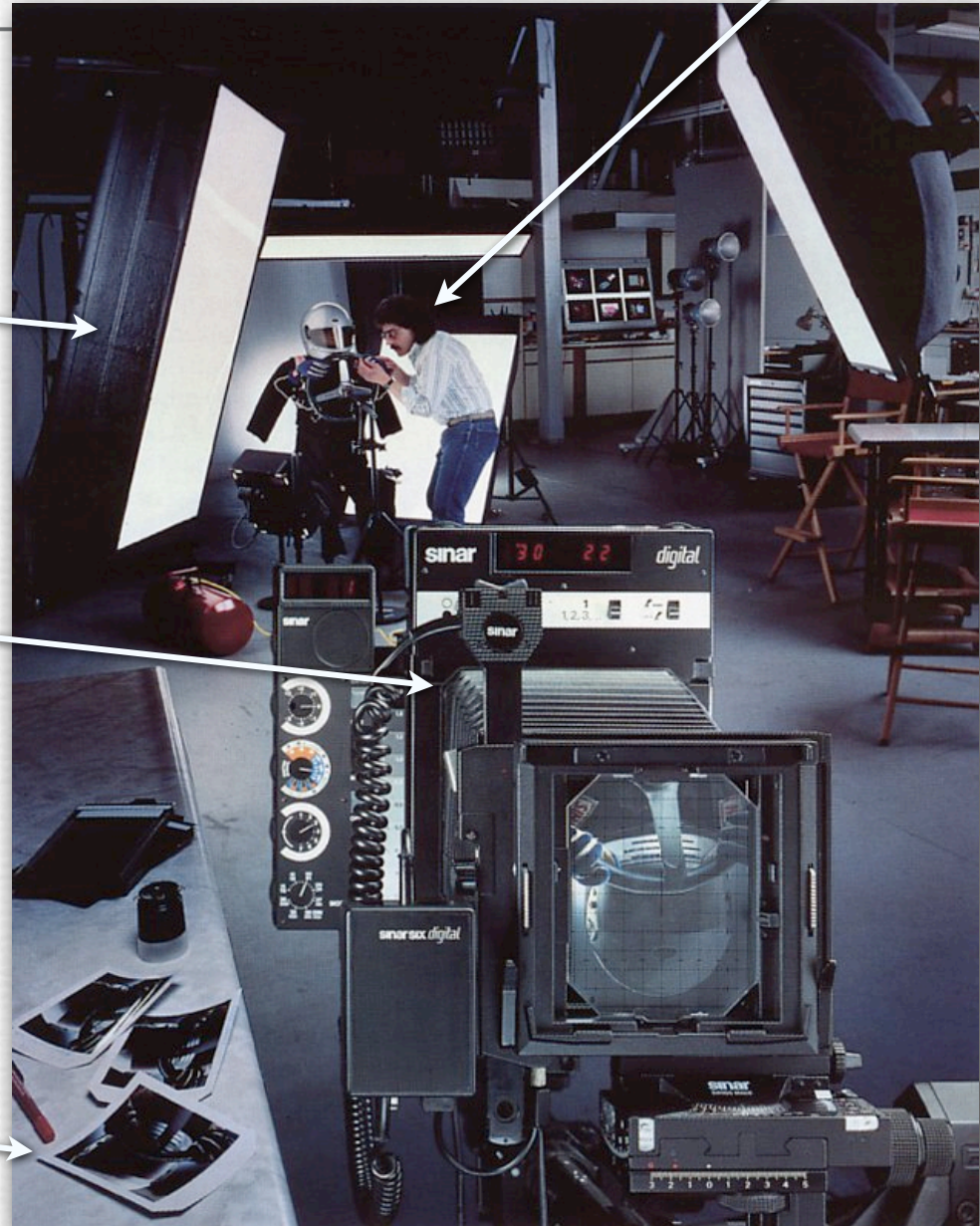
Lighting rigs can be large

1970's haircut

soft box

film view camera with
digital light meter

polaroid
preview
pictures



Basic portrait lighting

(London)



main/key



fill



accent/rim



background

Basic portrait lighting

(London)



Alternative lighting arrangements

- ◆ main light on side towards camera - broadens narrow faces
- ◆ main light on side of face away from camera - most common
- ◆ main light directly in front of face - glamour lighting

broad



short



butterfly



Alternative names for arrangements

- ◆ broad lighting is sometimes called Rembrandt lighting
 - note triangular light on her left cheek (right side of image)



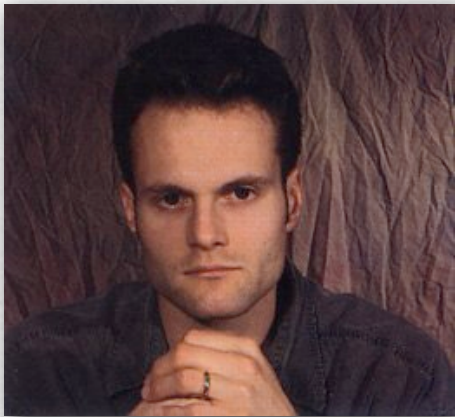
(Varis)



Rembrandt van Rijn,
Self Portrait, 1660

key:fill light ratio

(London)



1:1



2:1

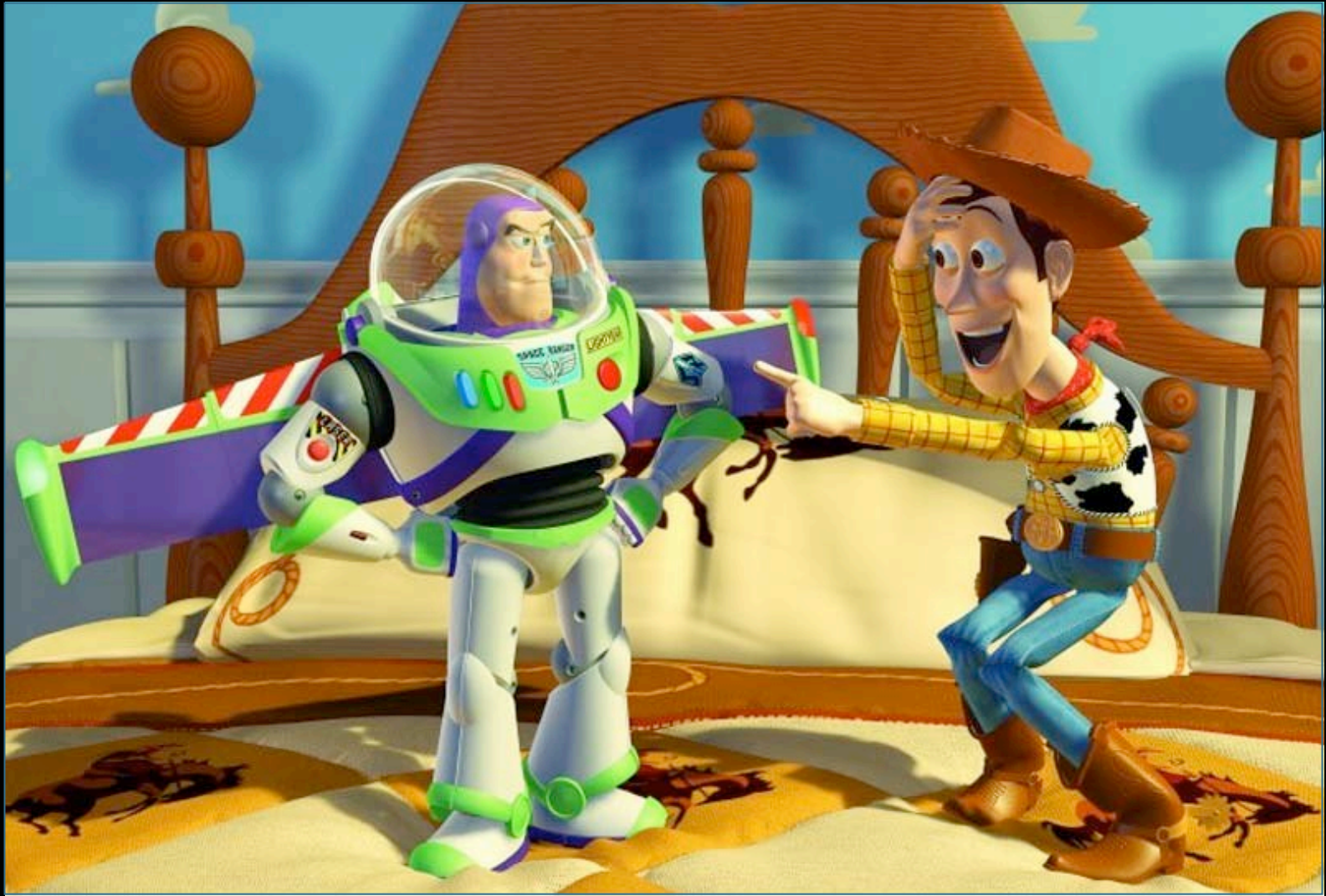


4:1



8:1

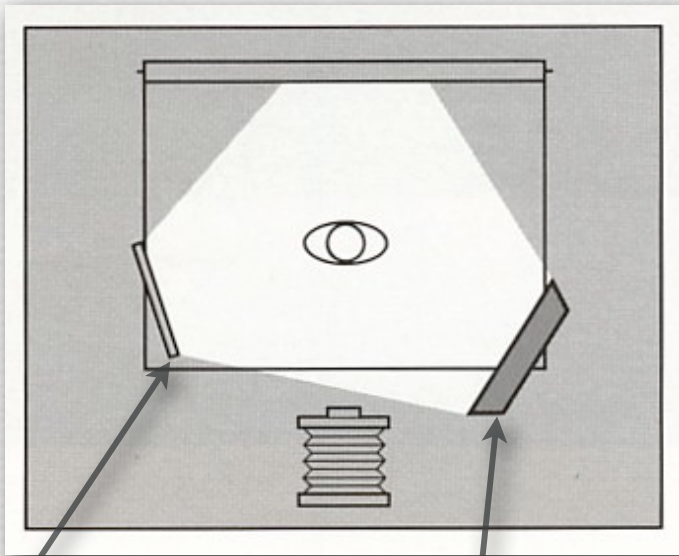
- ◆ 8:1 means 3 f/stops (3 doublings)
- ◆ think about the mood you want to convey
- ◆ the color of the key and fill lights can be different...



Pixar, Toy Story, 1995

Professional photographic lighting manuals

photographed by
D.W. Mellor



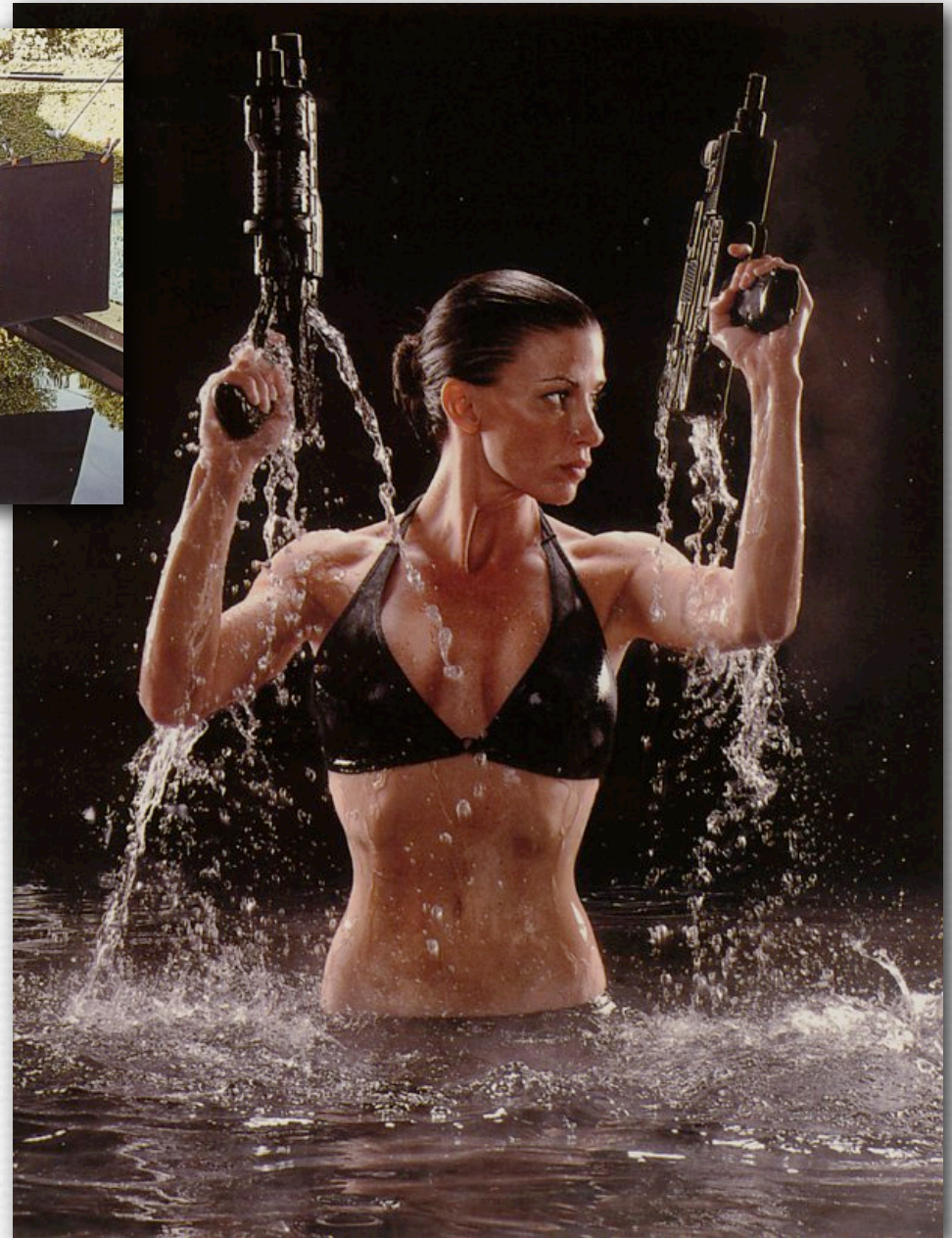
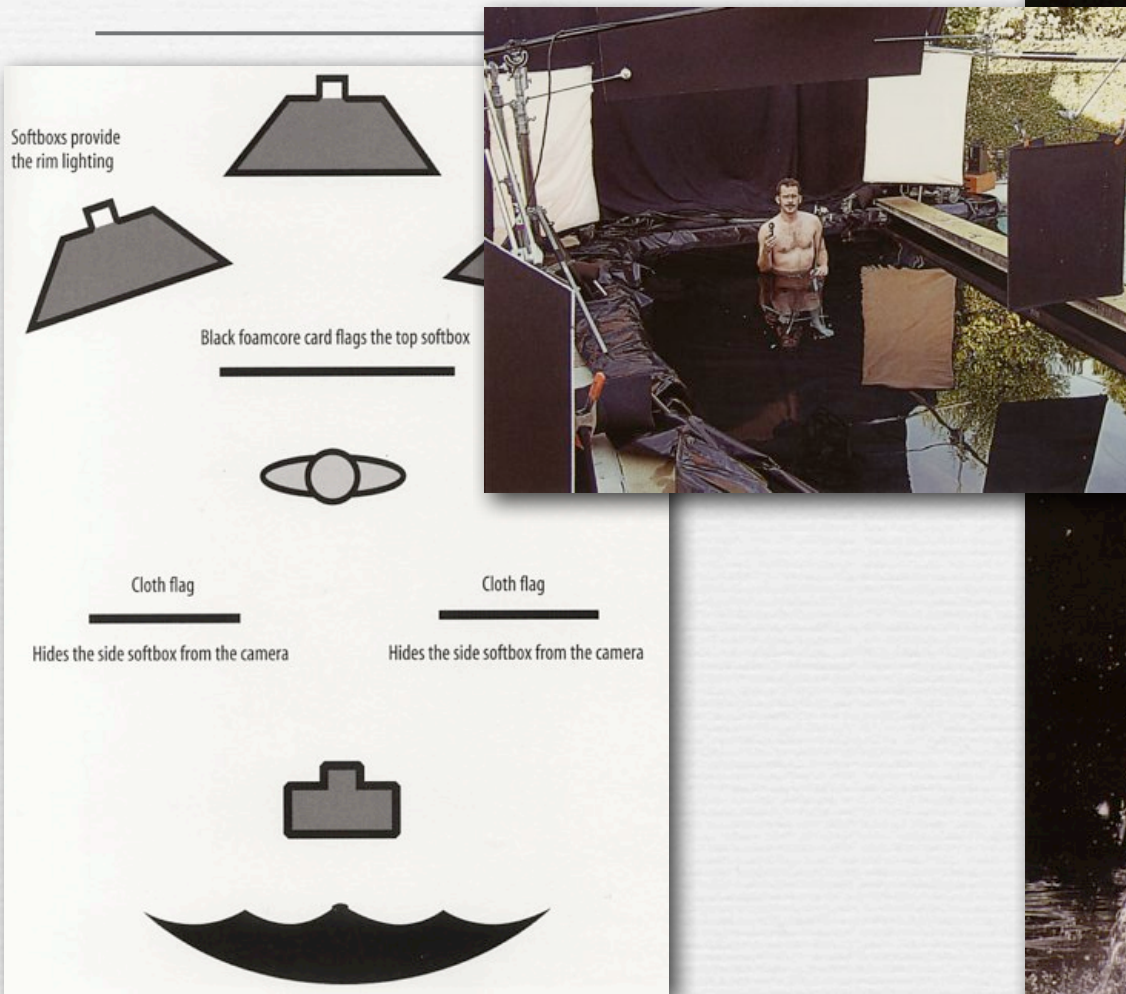
diffuse
reflector

diffused
spotlight

(Kodak)



Professional photographic lighting manuals



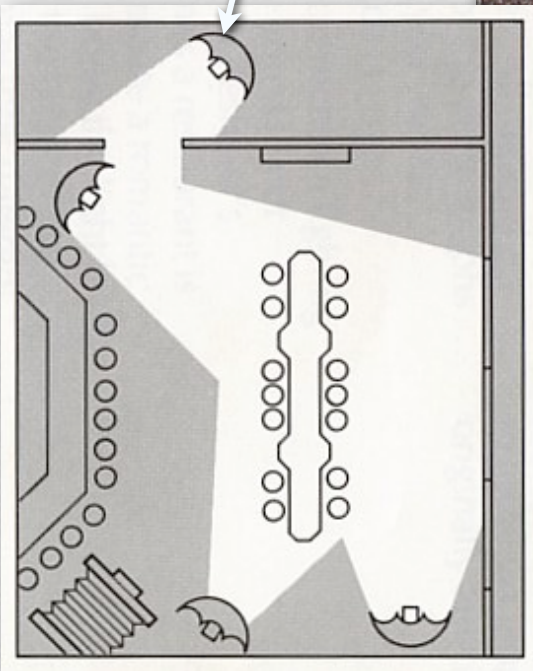
- ◆ darkfield lighting
- ◆ took all day to set up

(Varis)

Special problems: architectural interiors

2-second exposure
to show dusk outdoors

note lighting
in 2nd room

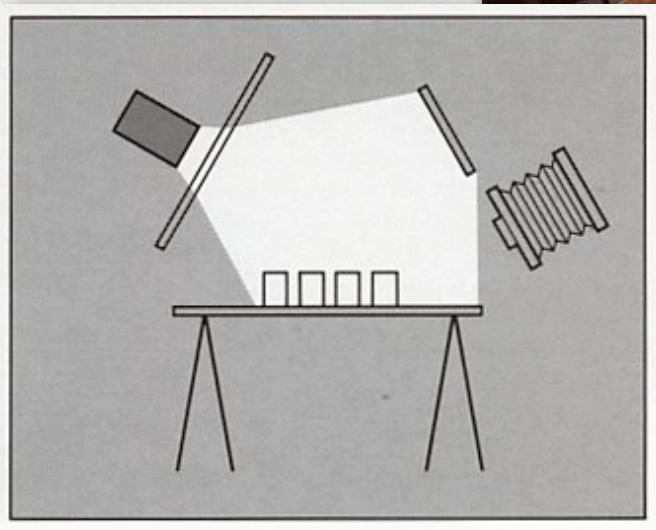
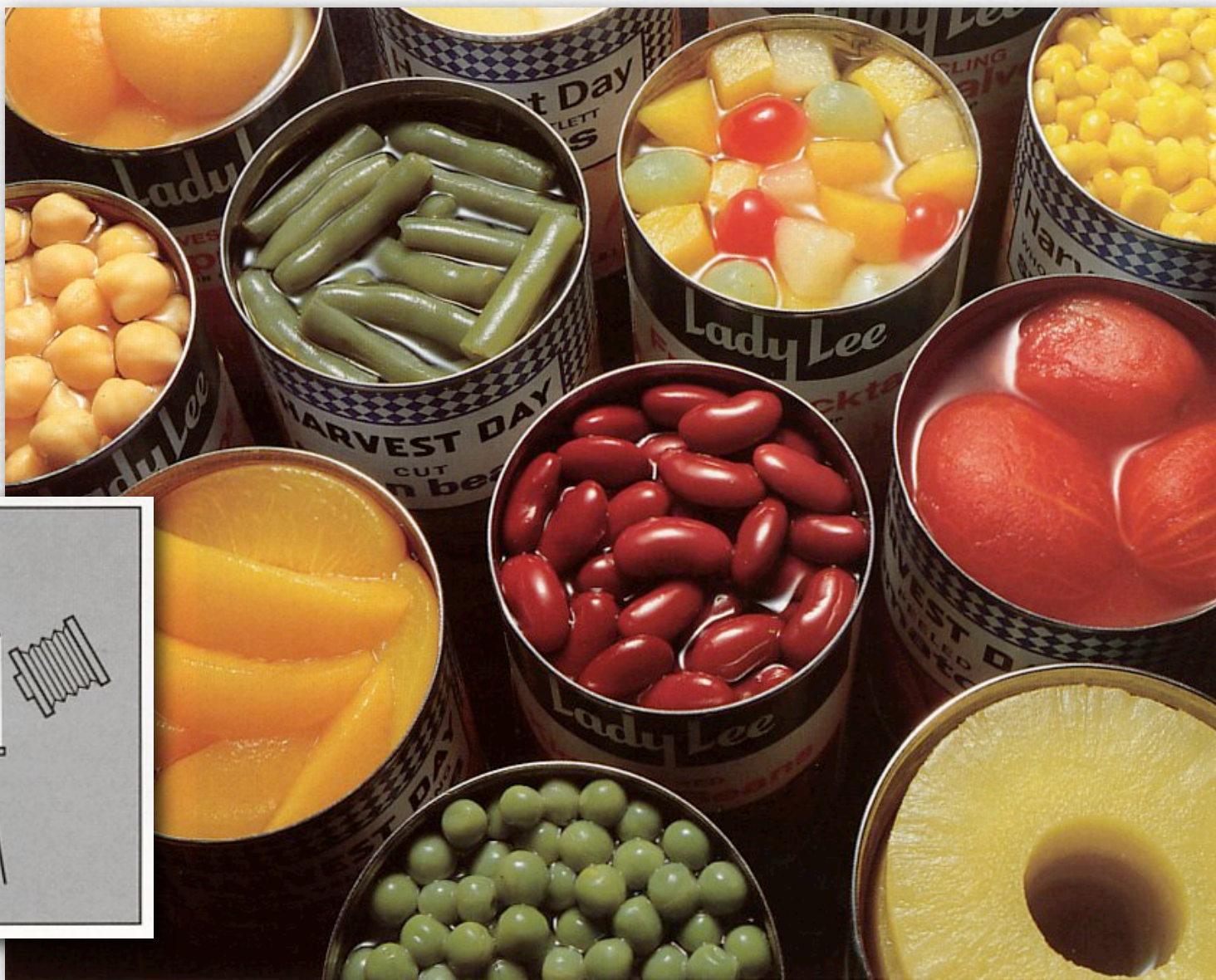


(Kodak)



Special problems: food (without breaking FTC laws)

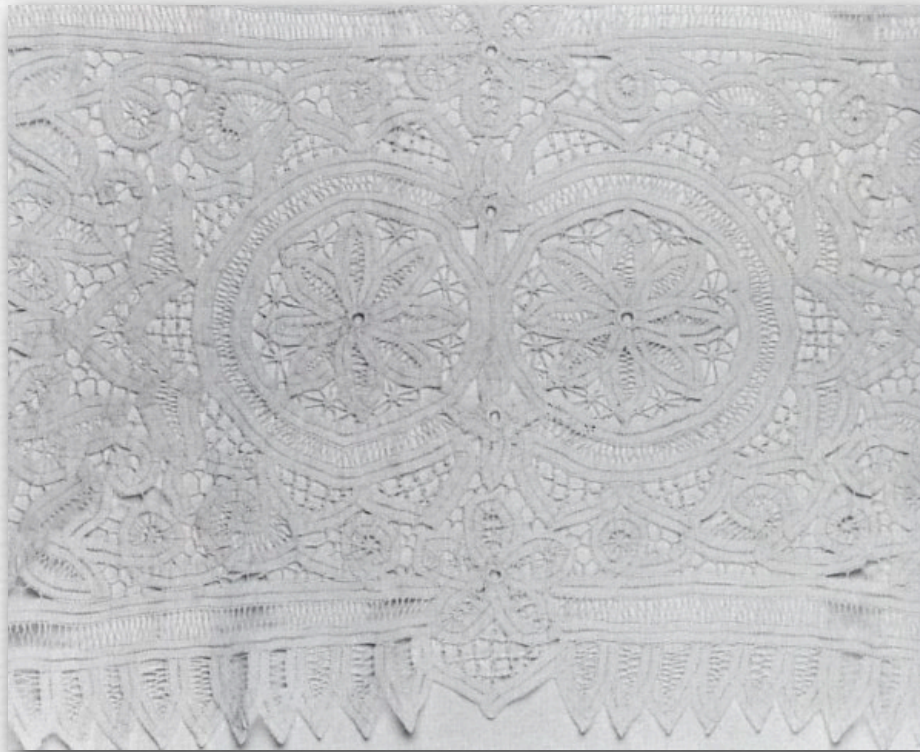
photographed by
Richard Fukuhara



(Kodak)

Special problems: surface details

(Hunter)



overhead light



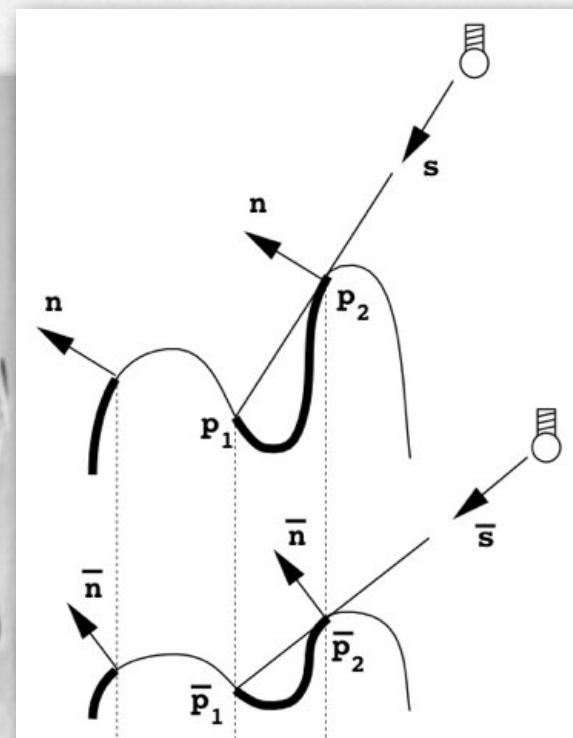
grazing light

How is this sculpture lit?



The bas-relief ambiguity

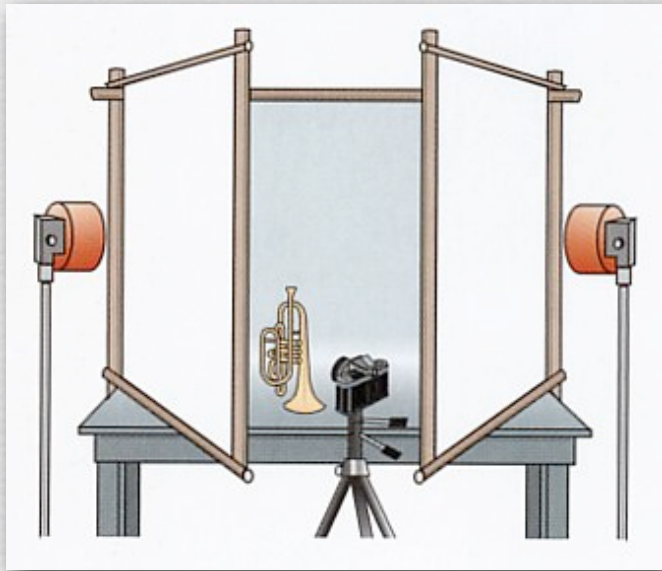
[Belhumeur CVPR 1997]



- ♦ changing the depth of an object is equivalent to changing the angle of lighting on it - they produce the same image
 - otherwise, bas-relief sculpture wouldn't work

Special problems: shiny objects

photographed by
Fil Hunter



(London)

When to use flash?

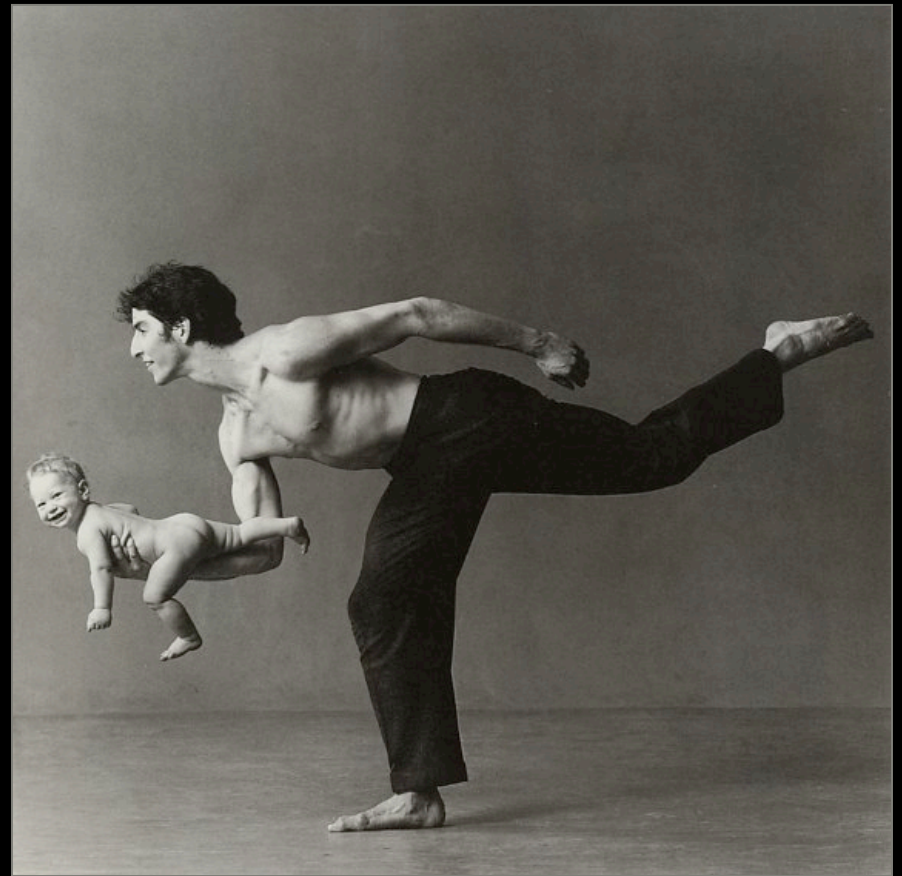
- ◆ freezing the action
- ◆ fill-flash
- ◆ flash-plus-ambient
- ◆ flash as a fill light
- ◆ ways to avoid using flash

Lois Greenfield,
dance photography,
1983-1988



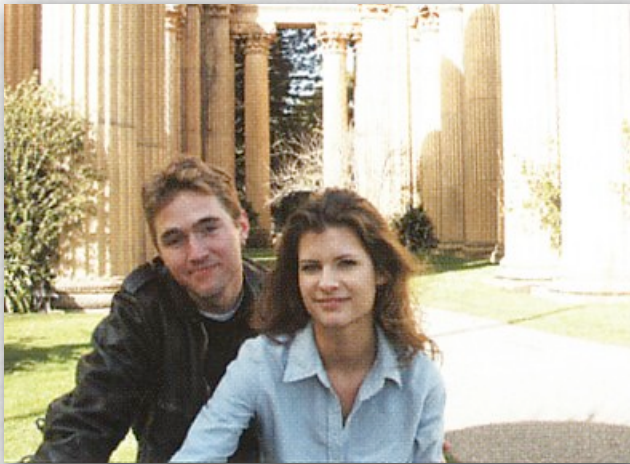


Lois Greenfield,
dance photography,
1983-1988

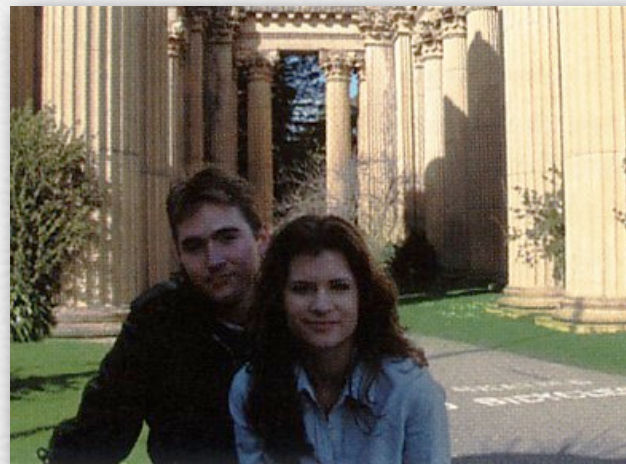


Fill-flash (for brightly lit backdrops)

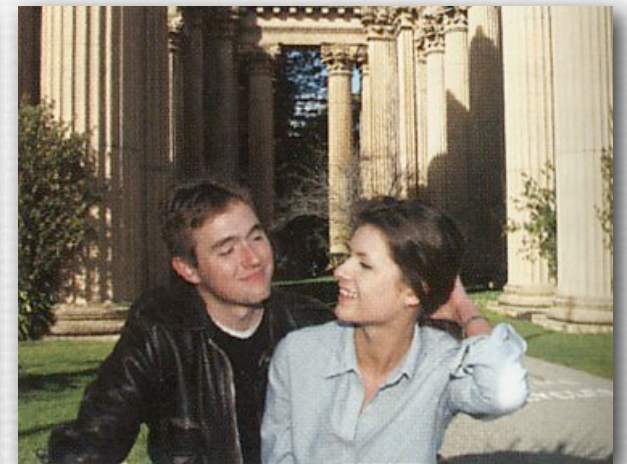
(London)



exposed for
foreground



exposed for
background



exposed for
background,
with fill flash

- ◆ shorten exposure, then add flash
- ◆ could instead use HDR, but that requires multiple shots

Flash-plus-ambient (in low light)

(Ang)



standard flash
exposure



1/4 second
with flash

- ◆ use flash, and lengthen exposure
- ◆ avoids isolating the foreground from its background

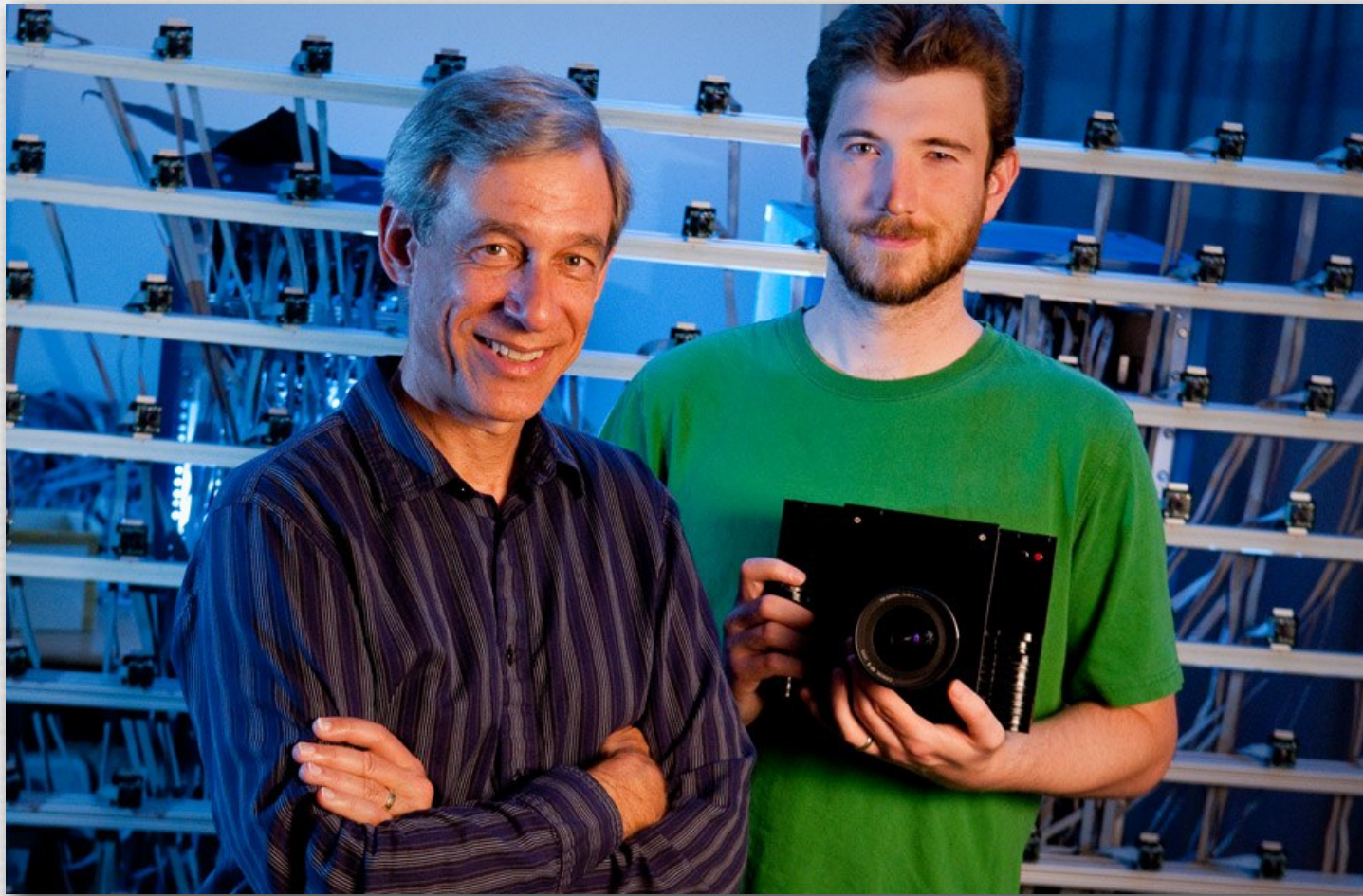
Flash as a fill light



as cameras get more sensitive, flash is less frequently needed when the scene is dark, but it's still useful for changing the light balance or color

- ◆ golden hour sun + off-camera fill flash
(Canon 5D Mark II, Speedlite 580EX, orange gel)

How was this shot lit?

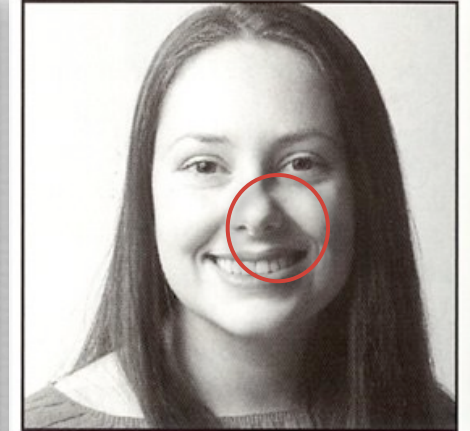
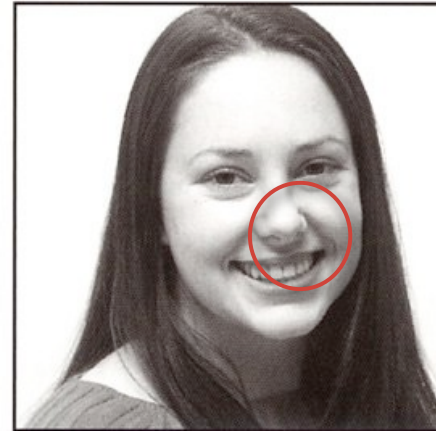
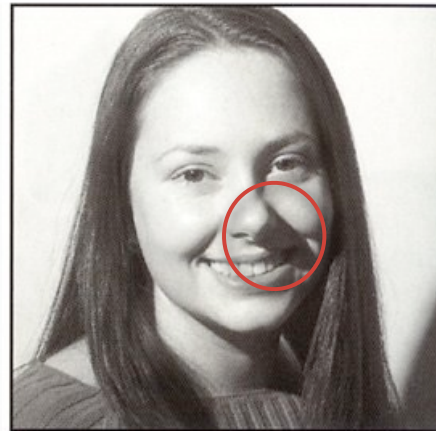
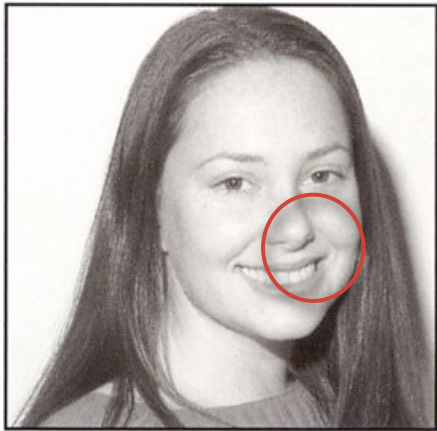


(Linda Cicero)

- ◆ key flash (on right side of scene) with orange gel & umbrella
+ fill flash (extreme left side of scene) with no gel or diffuser
+ background flash (pointed at back wall) with blue gel

Flash placement

(London)



direct flash,
on camera

direct flash,
off camera

bounce flash,
from above

bounce flash,
from the side

Flash technology

(Race Gentry)



1880: flash powder

powdered magnesium +
potassium chlorate +
antimony sulfide



1927: flashbulbs

aluminum foil in oxygen,
later tungsten or zirconium filament
coated in explosive primer paste

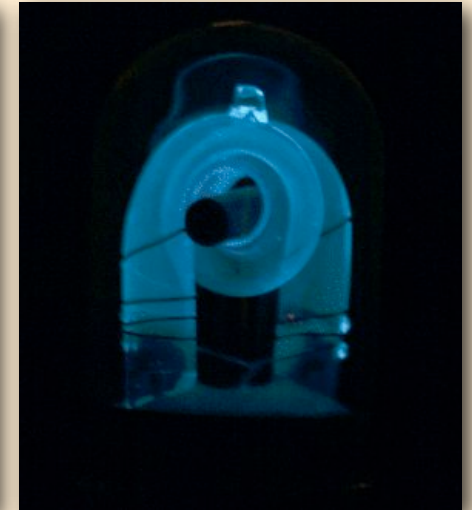
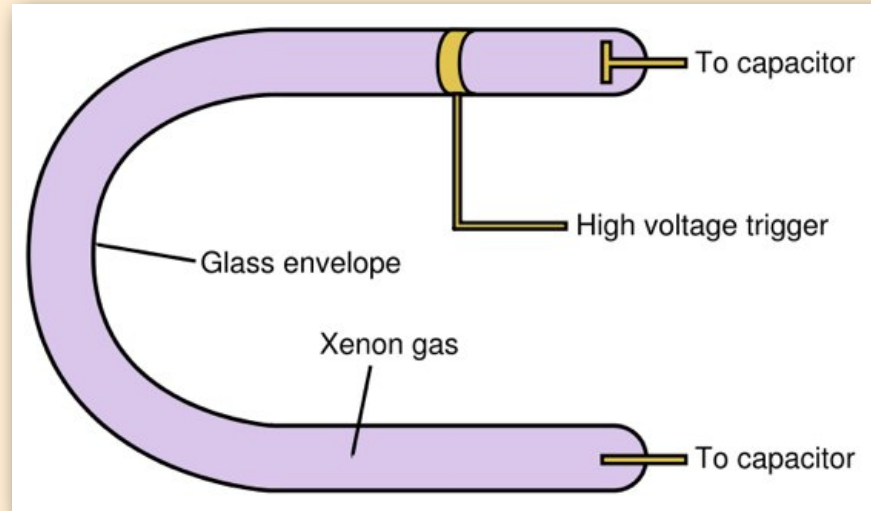


1960s: flashcubes

Electronic flash



Canon 580EX

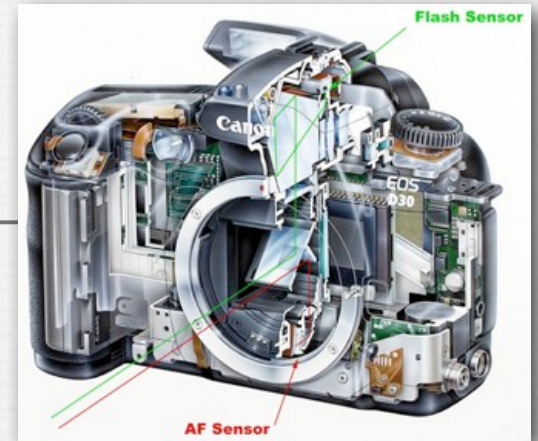


(wikipedia)

- ◆ battery charges up a capacitor (dangerous when disassembled!)
- ◆ high-voltage trigger ionizes the gas inside the tube, reducing its resistance to the flow of electricity and causing streamers of ionized gas to form (like “leaders” in lightning)
- ◆ the capacitor discharges through the ionized gas, heating it to a plasma state and causing an intense but brief discharge of light

Metering for flash photography

(Canon E-TTL or Nikon iTTL, including Nikon D40)

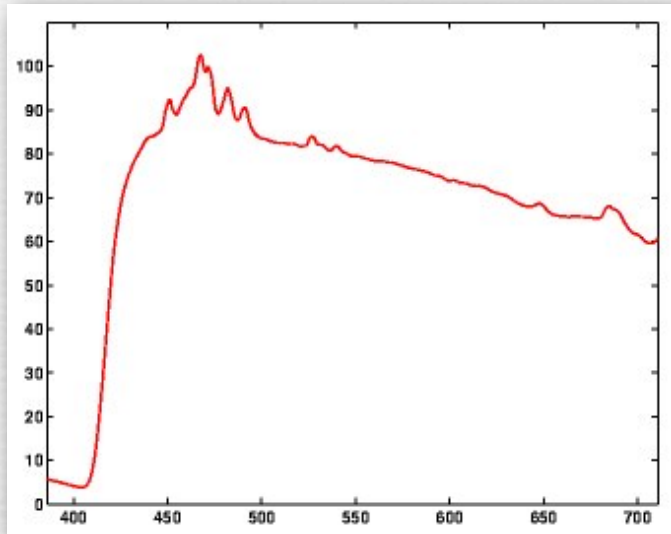


- ◆ on shutter half-press, focus under ambient light (or AF assist light) and meter for ambient light
- ◆ on shutter press, fire weak preflash and record on flash sensor
- ◆ compute some combination of aperture, flash duration, and ISO
 - decision uses multi-point metering of ambient light, multi-point autofocusing, shooting mode, etc.
- ◆ flip up mirror, open shutter, and fire flash

- ◆ drawbacks
 - fooled by specular objects, scenes that fool metering and focusing,...
 - delay between pre-flash and flash is long enough to cause some people to blink, especially if using 2nd curtain sync

Color temperature of xenon flash

(graphics.cornell.edu)



- ◆ broad spectrum, approximates daylight (6500°K, i.e. D65)
- ◆ if mixed with ambient tungsten light, flash will look blue if WB is Tungsten, or background will look orange if WB is Flash
 - can compensate with color correction filter on the flash
 - filters are enumerated in °K of correction
 - filters reduce effective flash power

Other flash features

- ◆ flash exposure lock (FEL)
- ◆ flash exposure compensation (FEC)
- ◆ flash exposure bracketing (FEB)
- ◆ strobe modes
- ◆ speciality flashes, like ring flash
- ◆ wireless master-slave
 - uses light pulses to pass messages
 - radio controls are also available (e.g. Pocket Wizard)
- ◆ check out <http://photonotes.org/articles/eos-flash/index2.html>

Problems with flash

- ◆ power falls as distance squared
 - subject is too bright
 - background is too dark
- ◆ in-camera flash is too close to lens
 - no shadows on subject
 - shadow of lens in wide-angle view
- ◆ red-eye
 - worse with in-camera flash
 - worse in low light (pupils are wide open)
 - pre-flash to shrink pupils, which looks better anyway
- ◆ shutter speed must be low enough that shutter is completely open
 - 1/90 - 1/250 sec on Canon EOS cameras (“flash synch speed”)
 - limits the range of shutter speeds for fill-flash
- ◆ don't shoot perpendicularly into glass



Recap

- ◆ flash can be used to freeze the action, as *fill-flash* for bright scenes, as *flash+ambient* for dark scenes, or as a fill light to change the balance or color of the lighting
- ◆ to avoid the deer-in-the-headlights look of on-camera flash (and its lack of shadows, and red eye), use *off-camera flash*, via a cord or remote control, or *bounce flash* off a wall or umbrella
- ◆ to adjust flash intensity, change its pulse duration; to adjust the amount of ambient light in the mix, adjust the shutter speed
- ◆ flash intensity is specified by a *guide number*
 - $F\text{-number} = \text{guide number} / \text{distance to subject}$
 - $2\times \text{distance to subject} \rightarrow 2\times F\text{-number} \rightarrow 4\times \text{illuminance}$
 - but under ambient light, large subjects don't dim with distance

Questions?

Slide credits

◆ Andrew Adams

- ◆ Stone, M., *A Field Guide to Digital Color*, A.K. Peters, 2003.
- ◆ Reinhard et al., *High Dynamic Range Imaging*, Elsevier, 2006.
- ◆ Minnaert, M.G.J., *Light and Color in the Outdoors*, Springer-Verlag, 1993.
- ◆ Hunter, F., Fuqua, P., *Light Science and Magic* (2nd ed.), Focal Press, 1997.
- ◆ Tanser and Kleiner, *Gardner's Art Through the Ages* (10th ed.), Harcourt Brace, 1996.
- ◆ London, Stone, and Upton, *Photography* (6th & 9th editions), Prentice Hall, 2008.
- ◆ Ang, T., *Digital Photography* (2nd ed.), DK Publishing, 2007.
- ◆ LoSapio, A., *Professional Photographic Illustration*, Eastman Kodak, 1989.
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- ◆ Varis, L., *Skin*, Wiley, 2006.
- ◆ Nissen, H.J., Damerow, P., Englund, R.K., *Archaic Bookkeeping*, University of Chicago Press, 1994.
- ◆ for a great tutorial on off-camera flash lighting, see <http://strobist.blogspot.com>