Photography 101

Fredo Durand
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- Make it more project centric. In terms of what they should work on step by step.
- First leave them in P mode and work on viewpoint & zoom.
- Then work on Aperture priority
- Then talk about shutter speed
- then change ISO
- then go to exposure compensation, histogram.
- mirror lockup, tripod

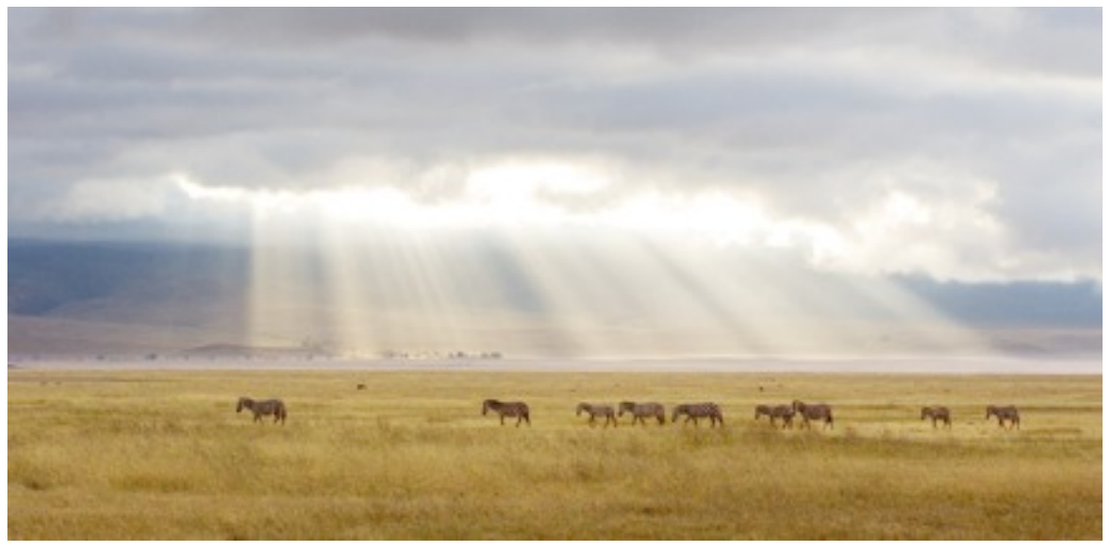
- then retouching.
- white balance
- crop
- brightness
- fill light
- local adjustment

- Then maybe specialize: portraits, landscapes, etc.

What do I know about good pictures?

- **Not much: amateur photographer, mostly wildlife & travel photography**

Photography



I like equipment

Imaging parameters

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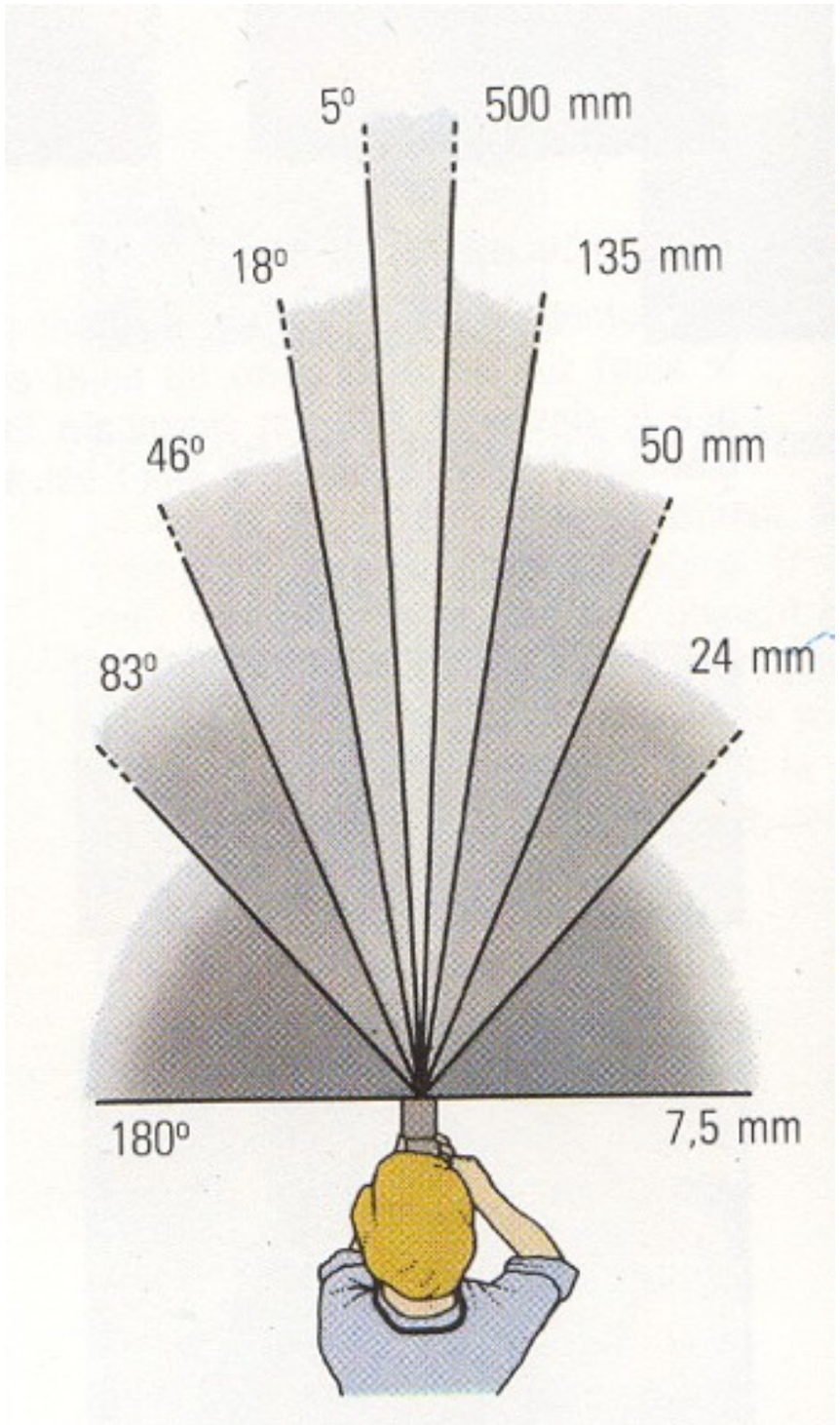
Imaging parameters

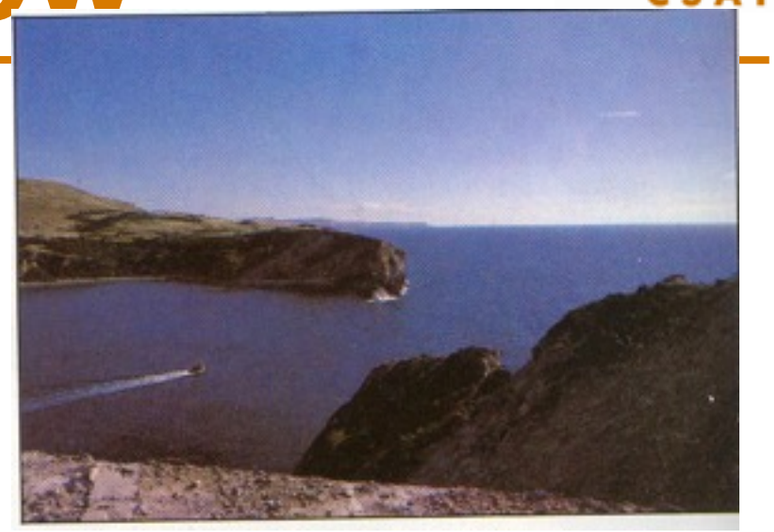
- Focal length
  - Sensor format
- Shutter speed
- Aperture
- ISO
  - Noise, sensor size
- Lighting
- Focus, depth of field

Focal length = field of view

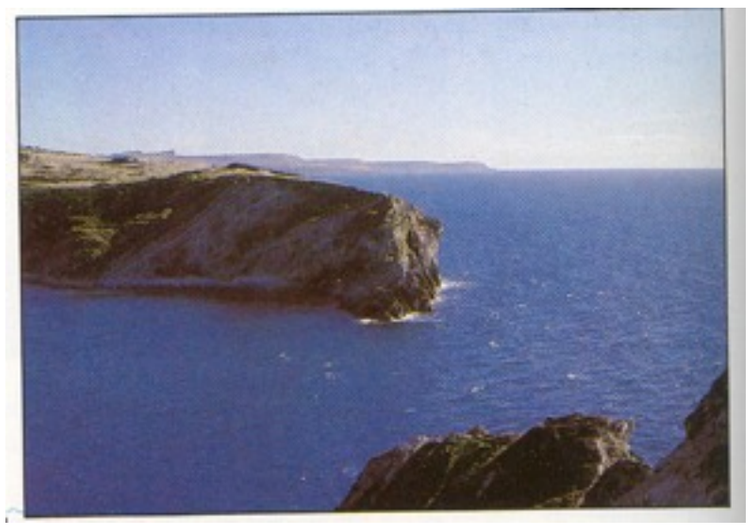
- **zooming changes the focal length**



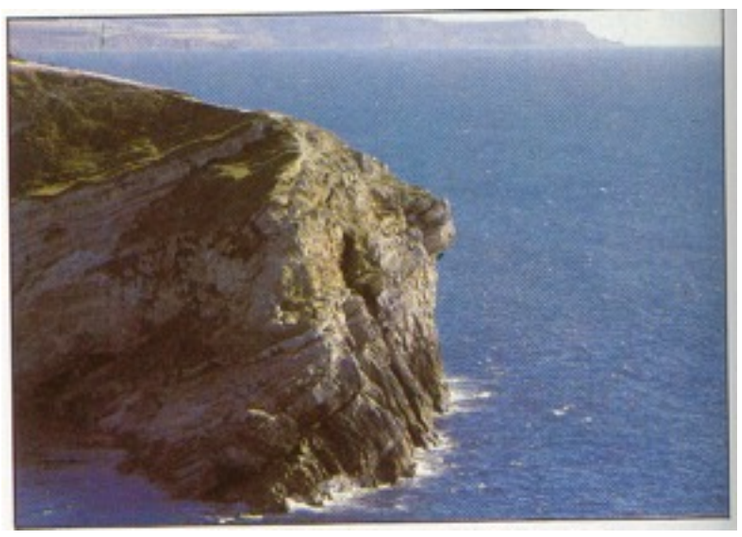
24mm



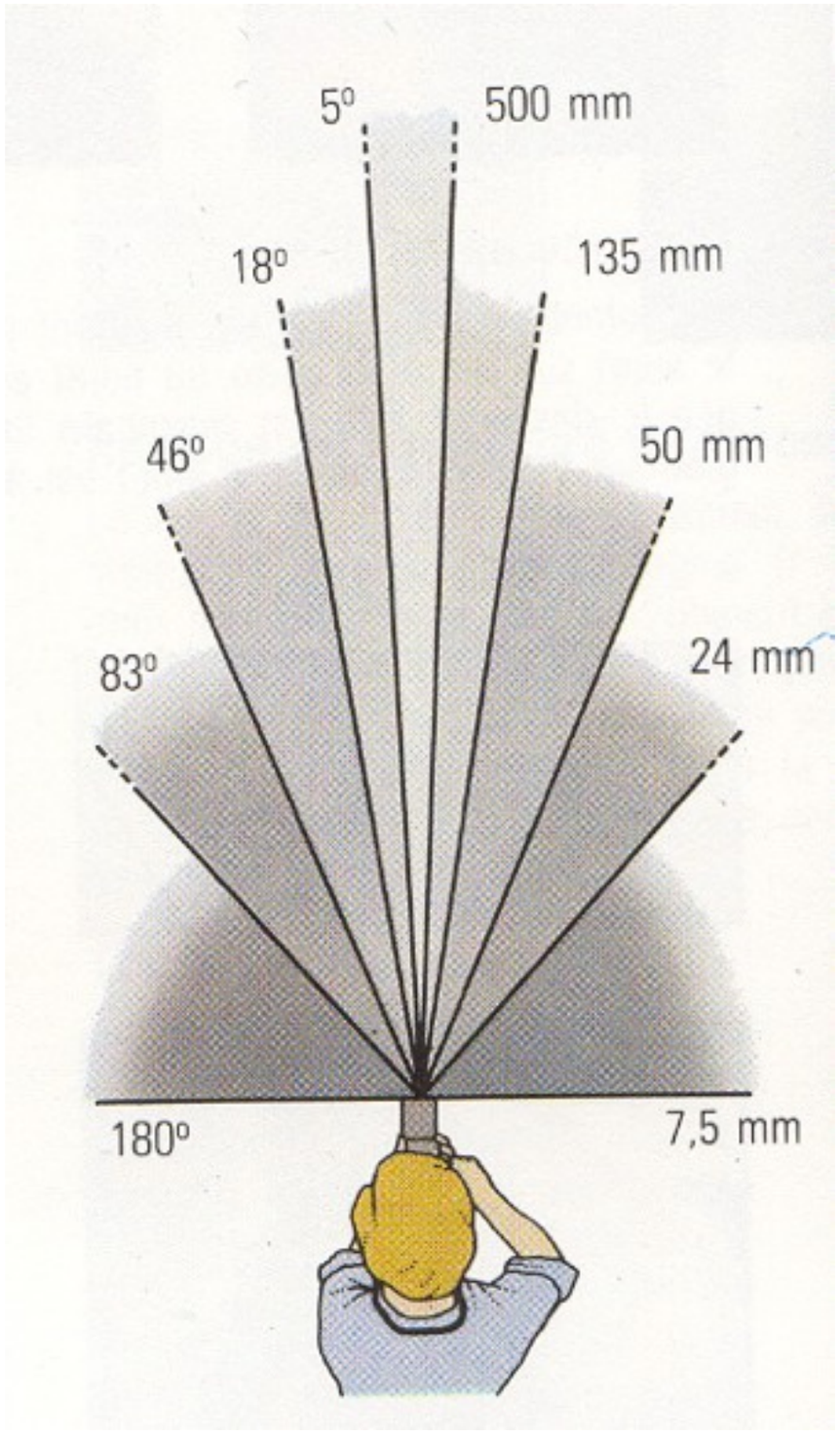
50mm



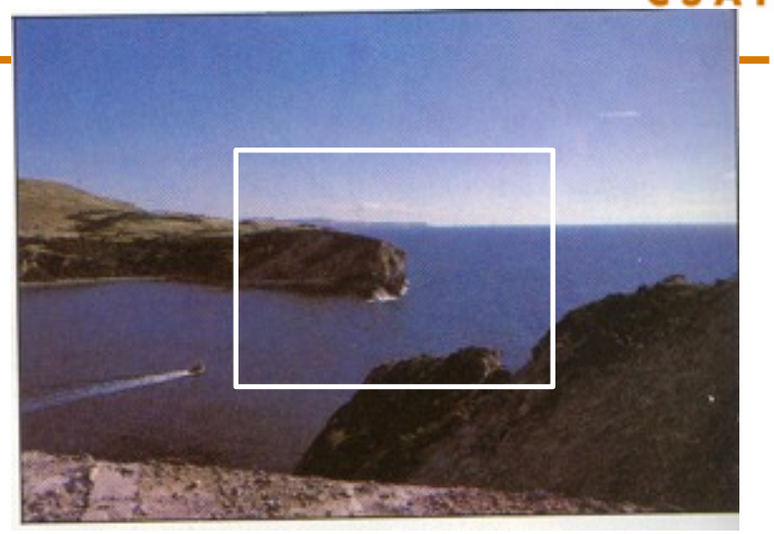
135mm



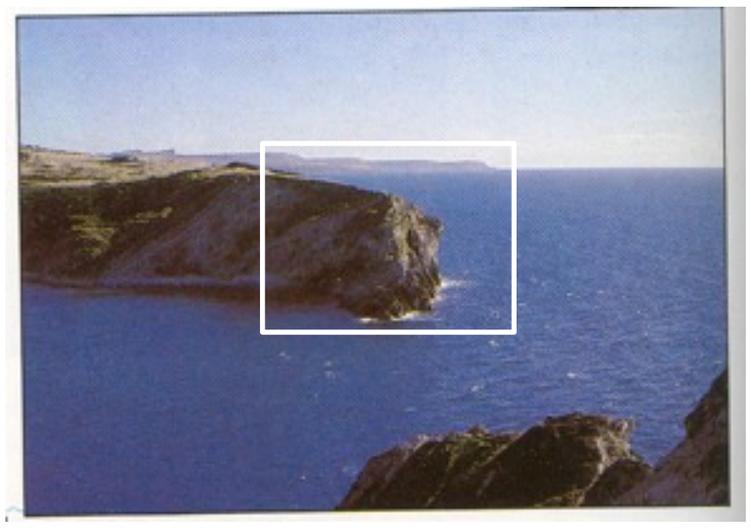
Focal length = cropping



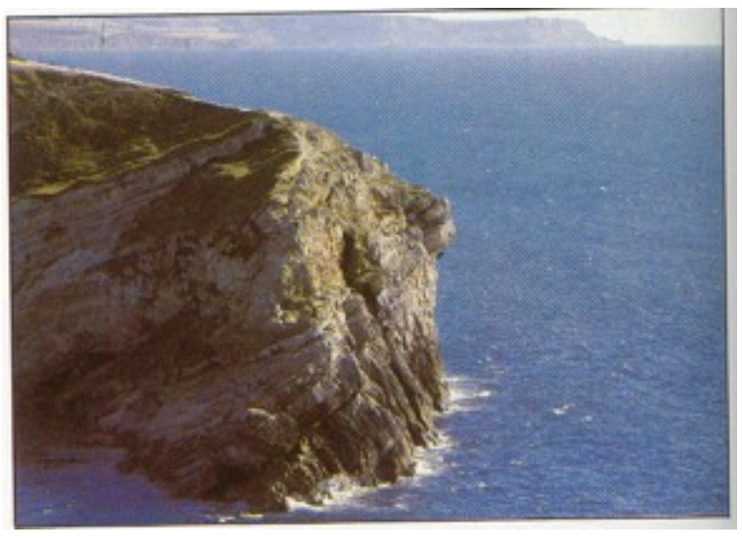
24mm



50mm

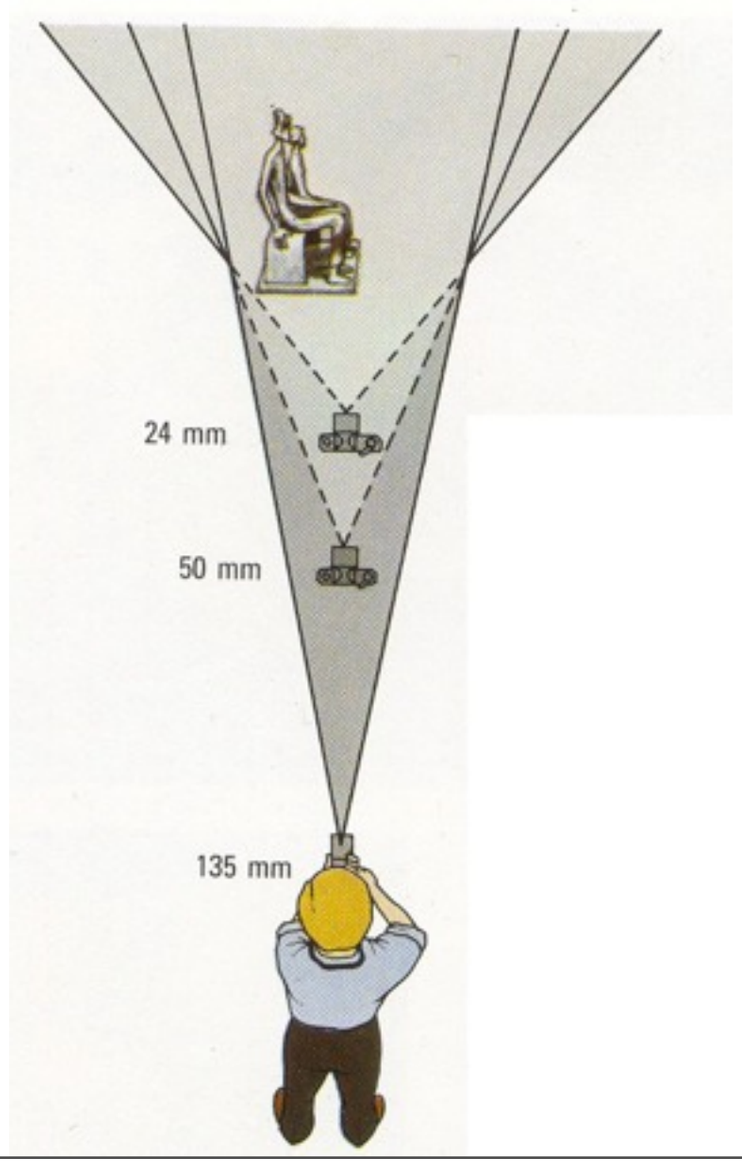


135mm

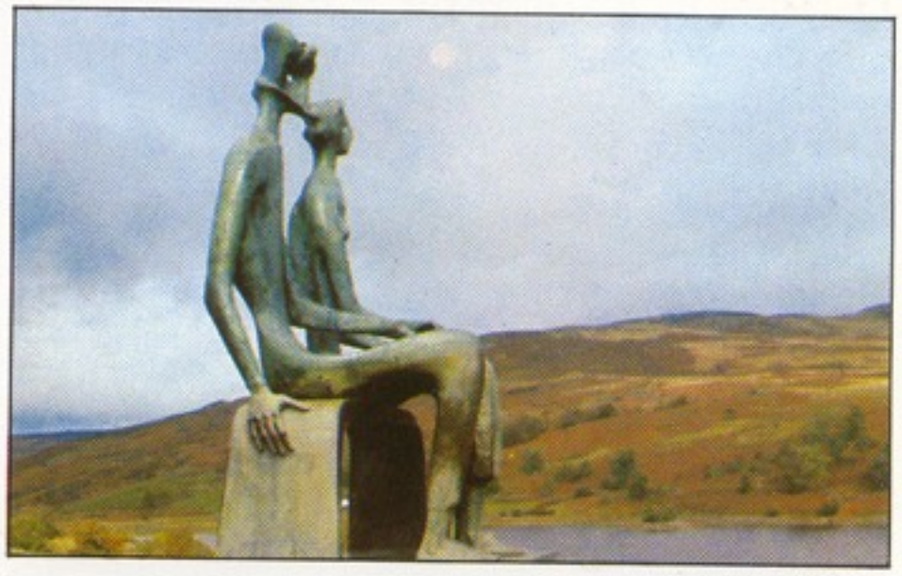


Focal length vs. viewpoint

- **Telephoto makes it easier to select background (a small change in viewpoint is a big change in background.**



Grand-angulaire 24 mm



Normal 50 mm

Longue focale 135 mm

Focal length vs. viewpoint

- **Martin Scorcese, Good Fellas**
- **Moves camera as you zoom in**
- **Better known as the Hitchcock Vertigo effect**

Perspective vs. viewpoint

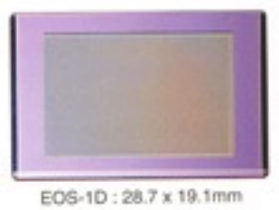
- **Portrait: distortion with wide angle**
- **Why?**

Wide angle

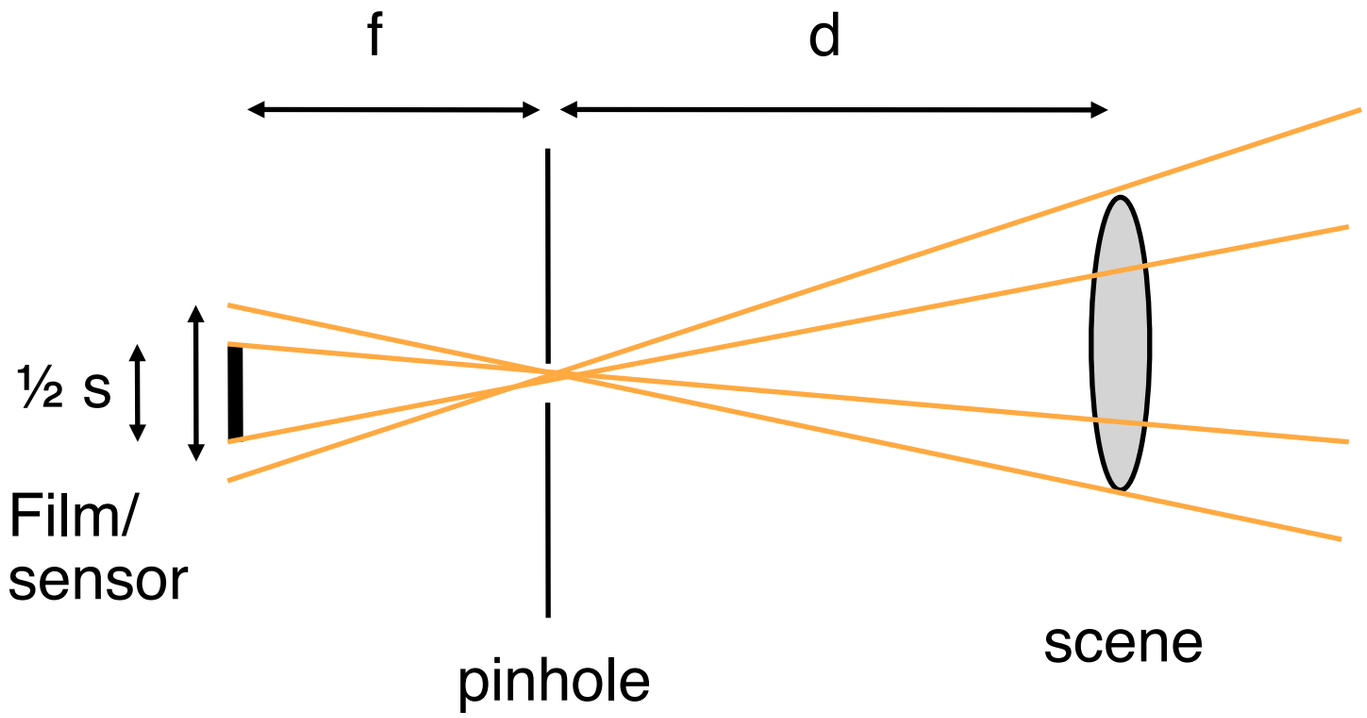
Standard

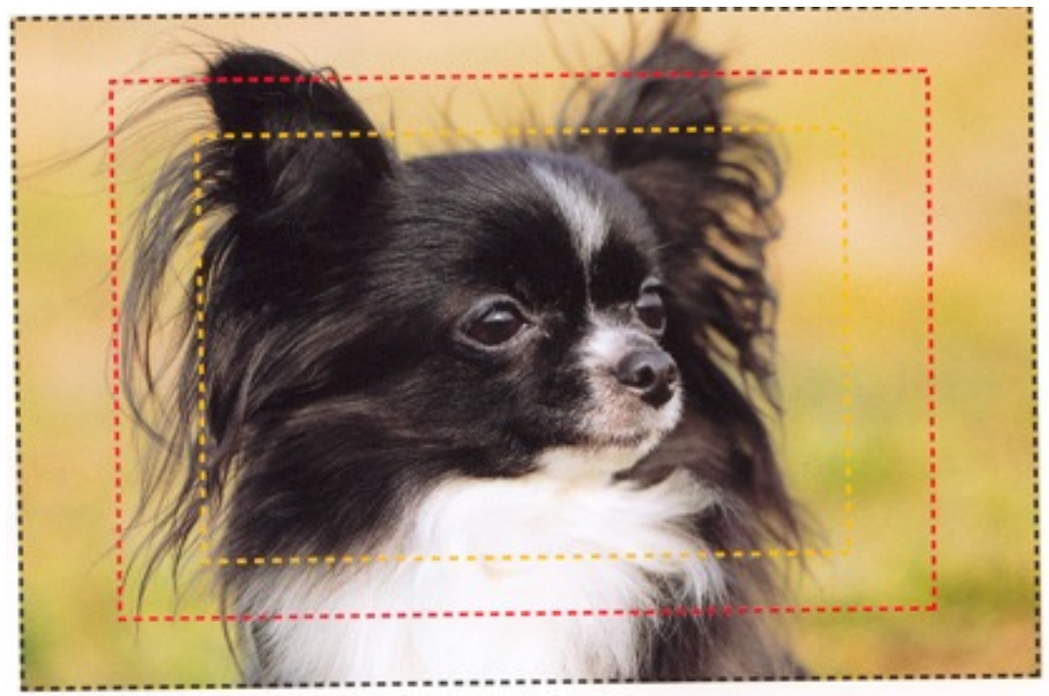
Telephoto

Focal length & sensor

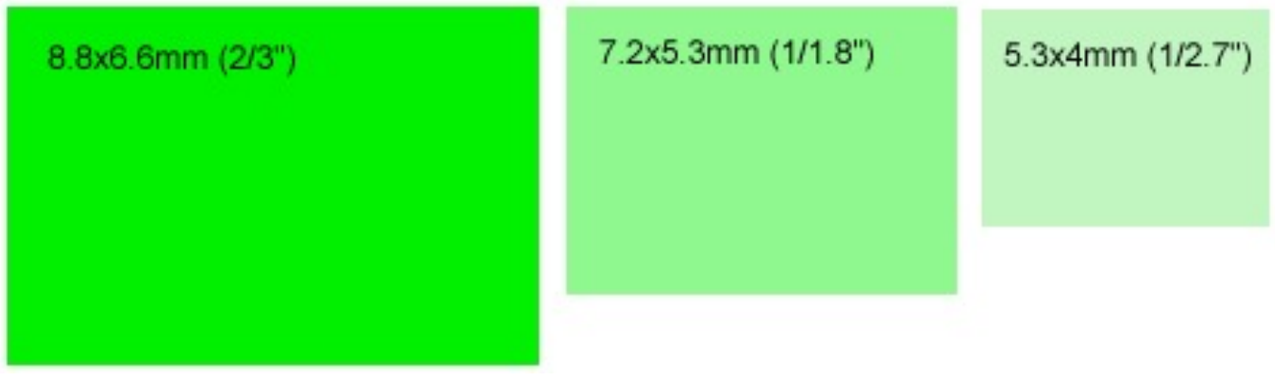


- **What happens when the sensor is half the size?**
  - It's like cropping!
  - The field of view is reduced by a factor of 2
  - The equivalent focal length for is multiplied by 2
  - Hence the so-called crop factor,
    and the notion of 35mm equivalent focal length
- **Most affordable SLRs have a 1.5 crop factor**





http://www.photozone.de/3Technology/digital_1.htm



Consequences of smaller sensor

- **Different field of view for same focal length**
- **Longer depth of field**
- **Increased noise**

Very wide angle

16mm

Very wide angle: include but distort

- **Difficult lens to use because it includes so much**
- **enables wide range of scales**

24mm

18mm

16mm

Medium wide angle

- **Inclusive, little distortion, intimate**

32mm

35mm

35mm

Normal: neutral

50mm

55mm

50mm

Medium telephoto: isolate

95mm

110mm

110mm

150mm

Telephoto

- **Isolate, control background, larger working distance, flattens the scene**

260mm

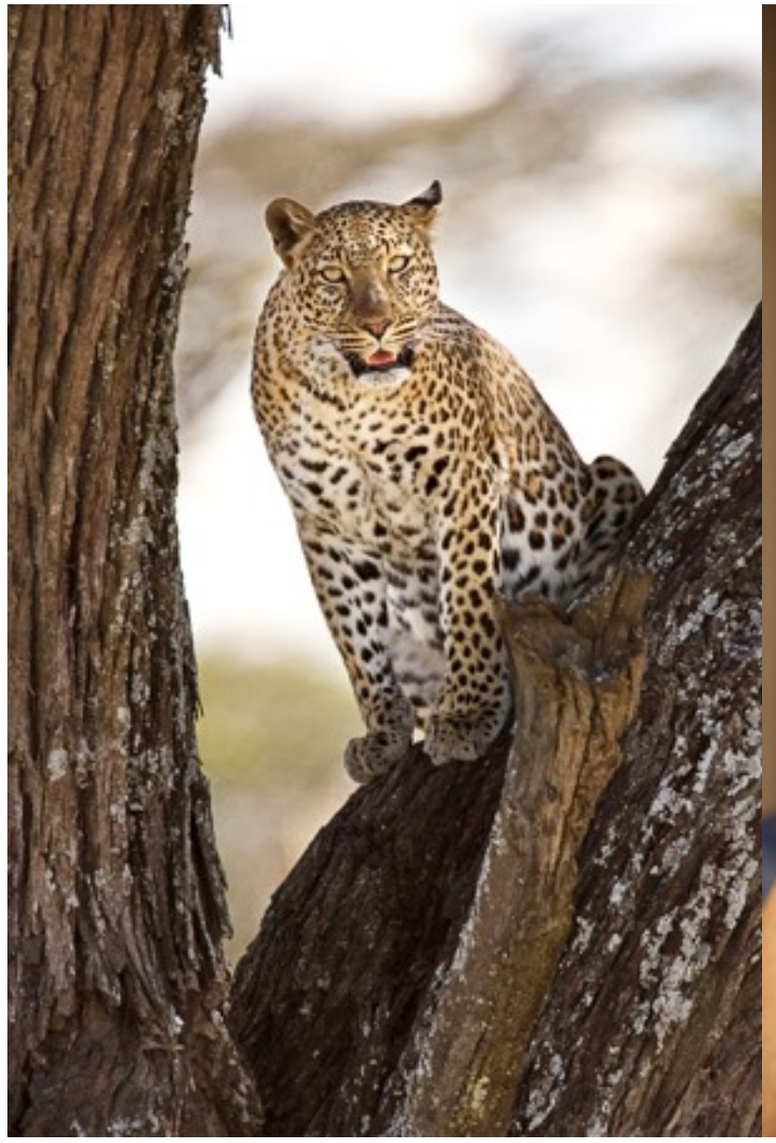
200mm

170mm

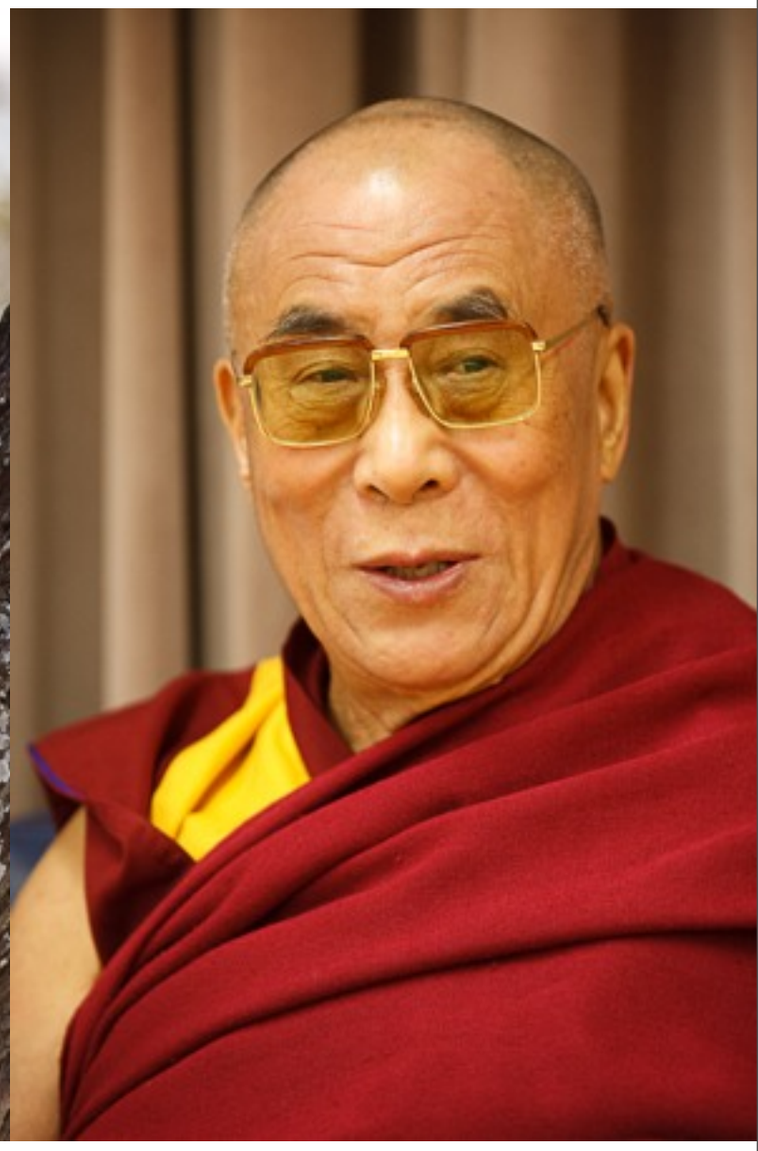
Super telephoto

910mm

910mm



910mm



390mm

Recap: focal length

- **focal length**
  = field of view
  = cropping
- **depends on sensor size**
- **zooming changes the focal length**

- **difference between viewpoint and focal length**

- **wide angle : <35mm**
- **telephoto : > 85mm**

Exposure

- **Get the right amount of light to sensor/film**
- **Two main parameters:**
  - Shutter speed
  - Aperture (area of lens)

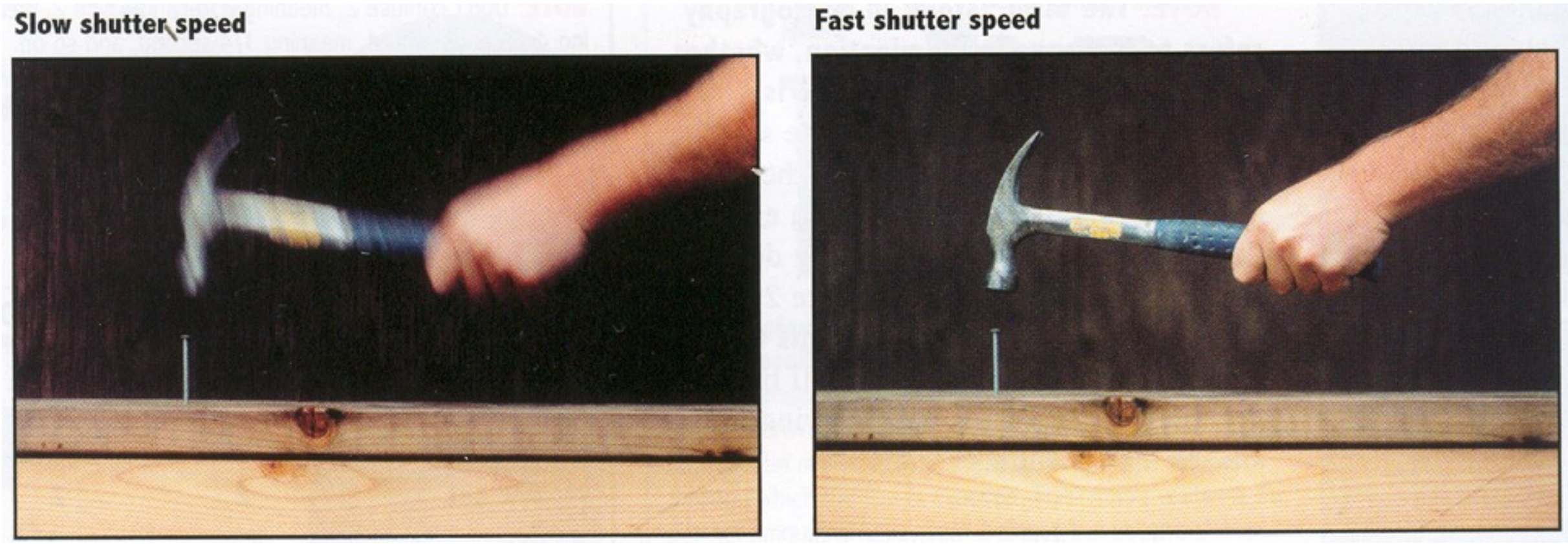
+ sensor/film sensitivity (ISO)

Shutter speed

- **Controls how long the film/sensor is exposed**
- **Pretty much linear effect on exposure**
- **Usually in fraction of a second:**
  - 1/30, 1/60, 1/125, 1/250, 1/500
  - Get the pattern ?
- **On a normal lens, normal humans can hand-hold down to 1/60**
  - In general, the rule of thumb says that the limit is the inverse of focal length, e.g. 1/500 for a 500mm

Main effect of shutter speed

- **Motion blur**



From Photography, London et al.

Effect of shutter speed

- **Freezing motion**

Walking people | Running people | Car | Fast train

1/125 | 1/250 | 1/500 | 1/1000

Note: it doesn't mean that shutter speed is proportional to the speed of the object. A photographer usually tracks the subject.

Fast shutter speed

1/640

1/500

1/500

Slow shutter speed for motion blur

0.8s

Tracking & slow shutter speed

1/8

Slow shutter speed to get light

15s

Normal shutter speed

1/100 at f/8

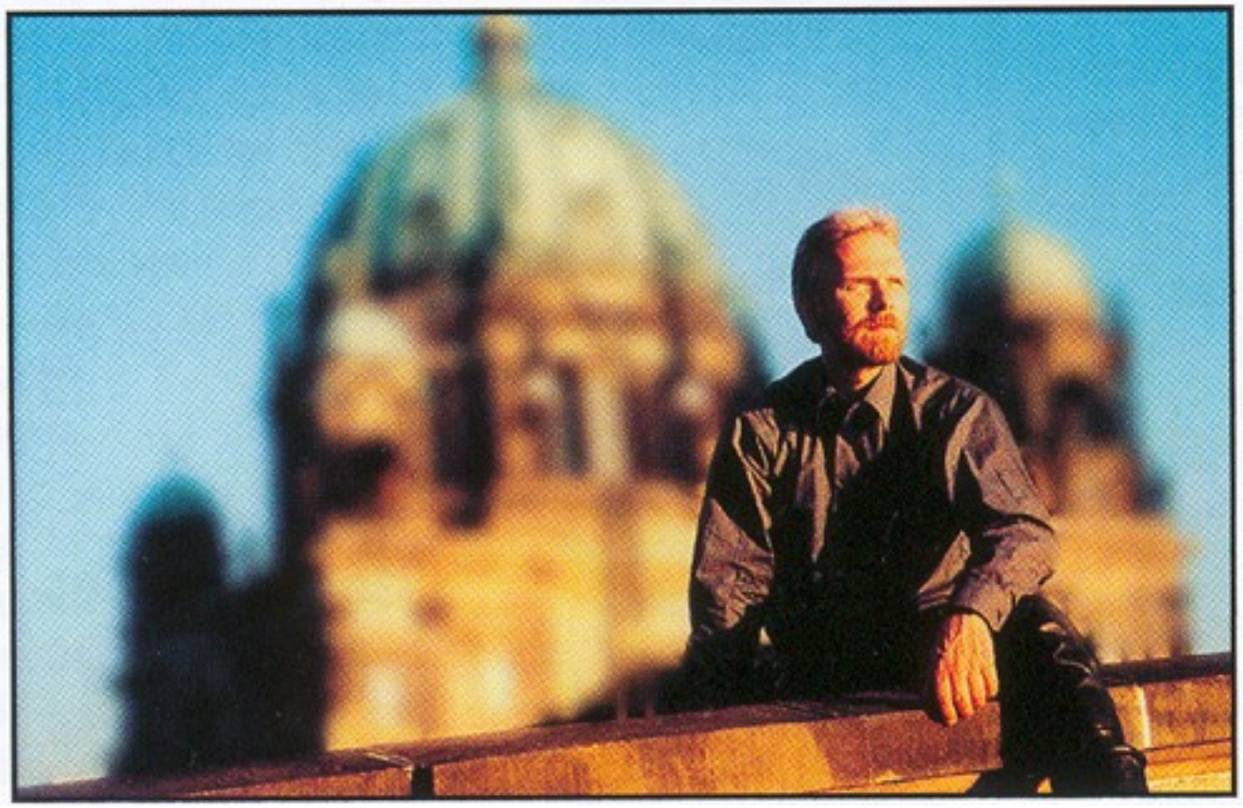
Aperture

- **Diameter of the lens opening (controlled by diaphragm)**
- **Expressed as a fraction of focal length, in f-number**
  - f/2.0 on a 50mm means that the aperture is 25mm
  - f/2.0 on a 100mm means that the aperture is 50mm
- **Disconcerting: small f number = big aperture**
- **What happens to the area of the aperture when going from f/2.0 to f/4.0?** divided by 4 (square of f number ratio)
- **Typical f numbers are**
  f/2.0, f/2.8, f/4, f/5.6, f/8, f/11, f/16, f/22, f/32
  - See the pattern?

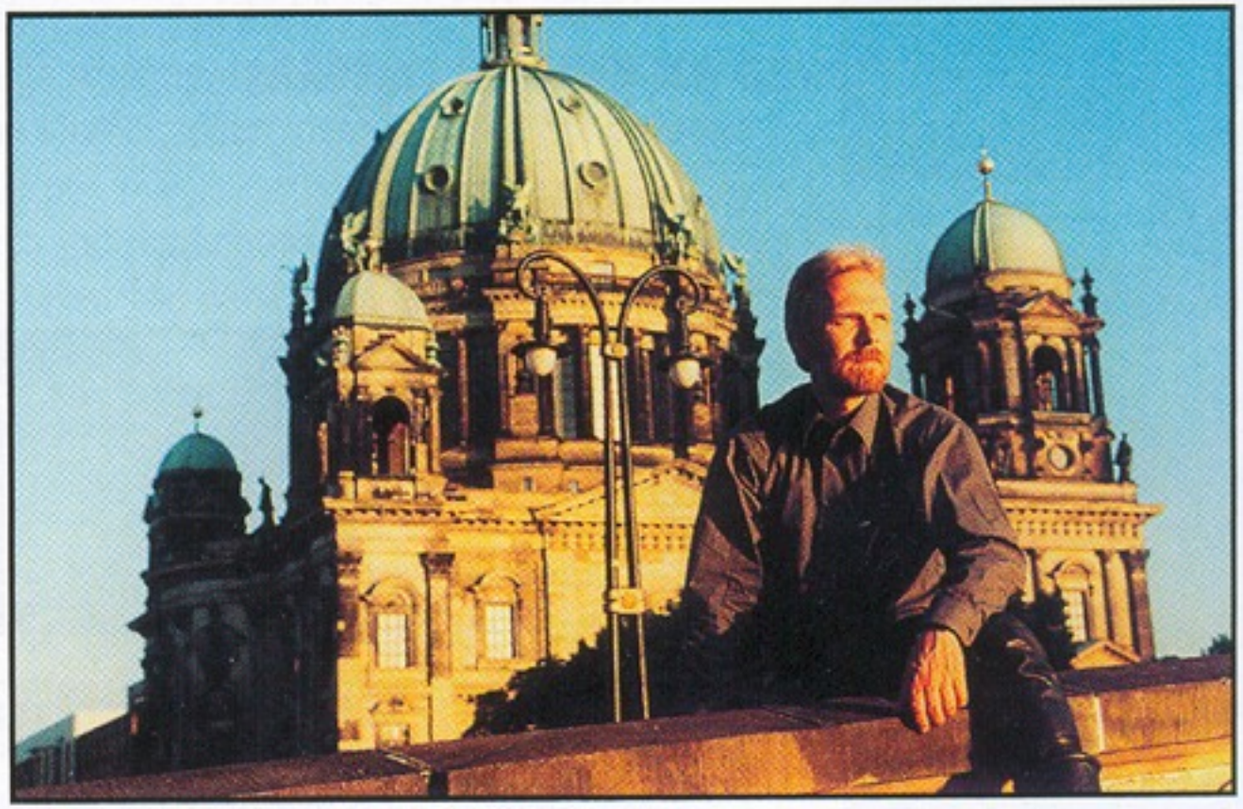
Main effect of aperture

- **Depth of field**

Large aperture opening

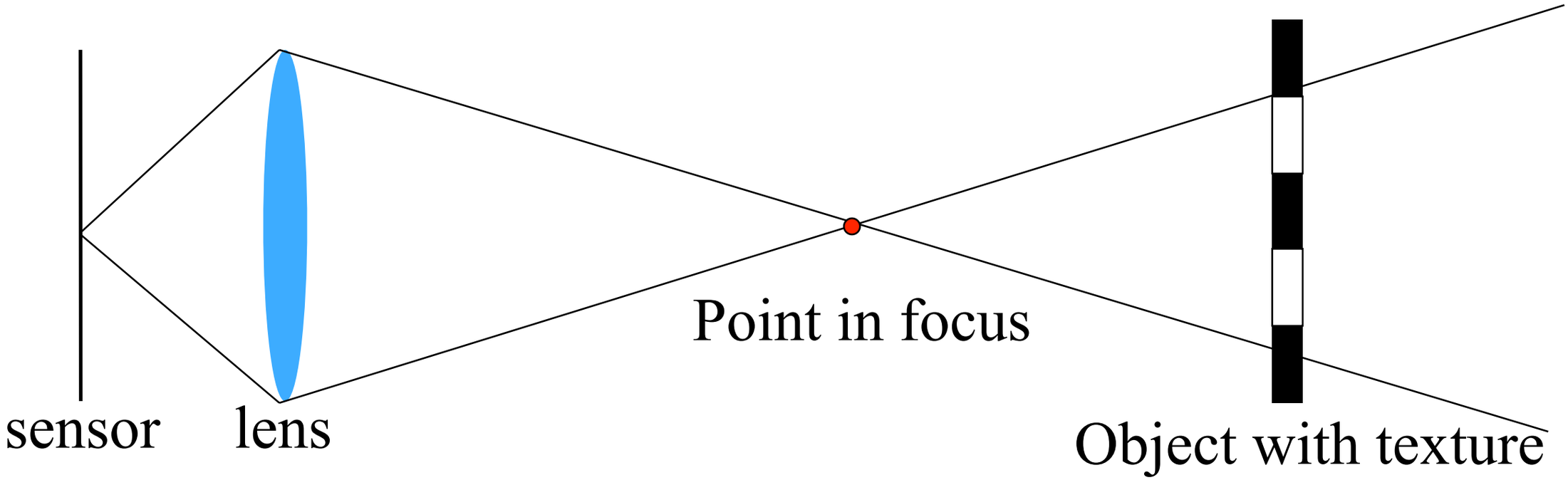


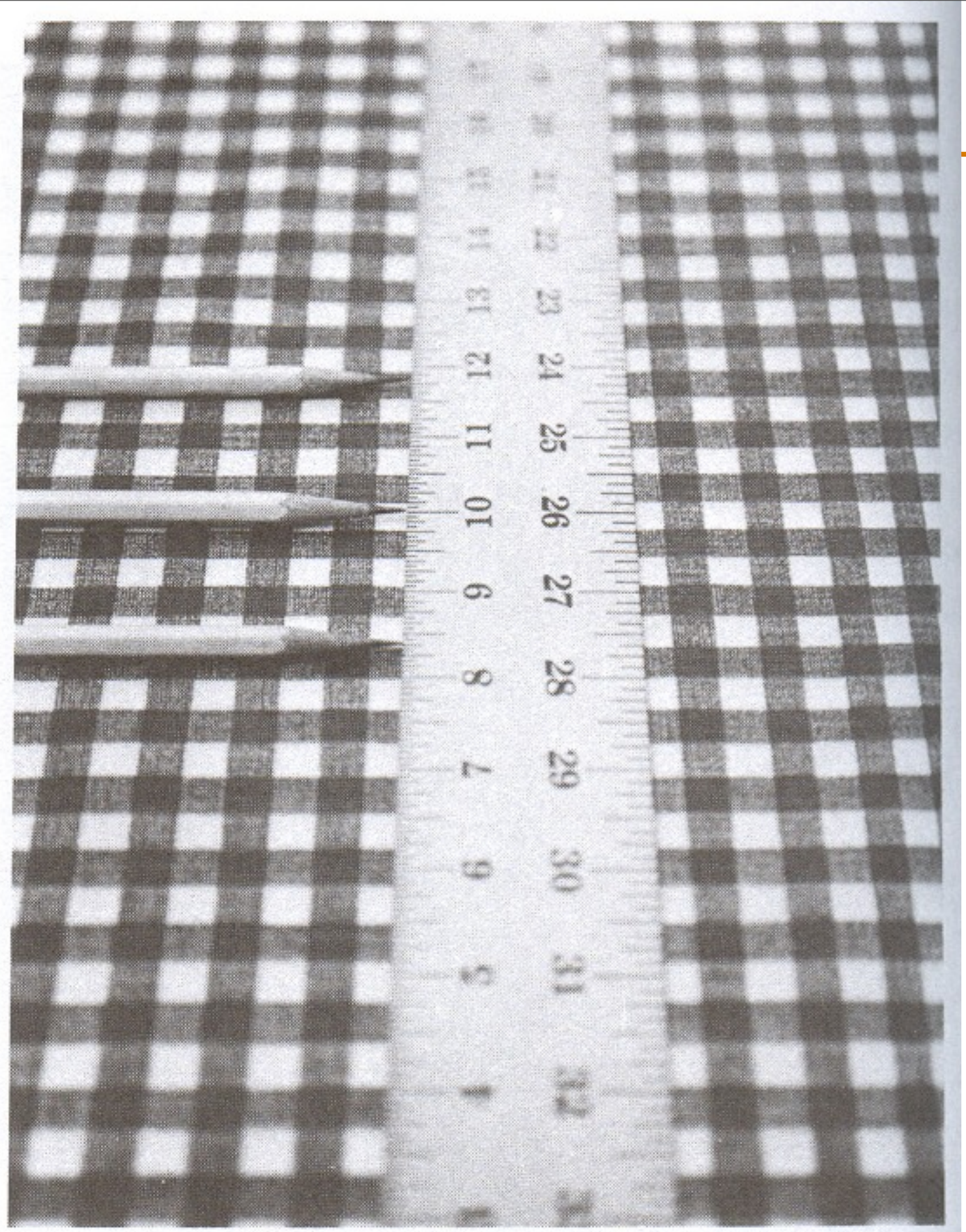
Small aperture opening



From Photography, London et al.

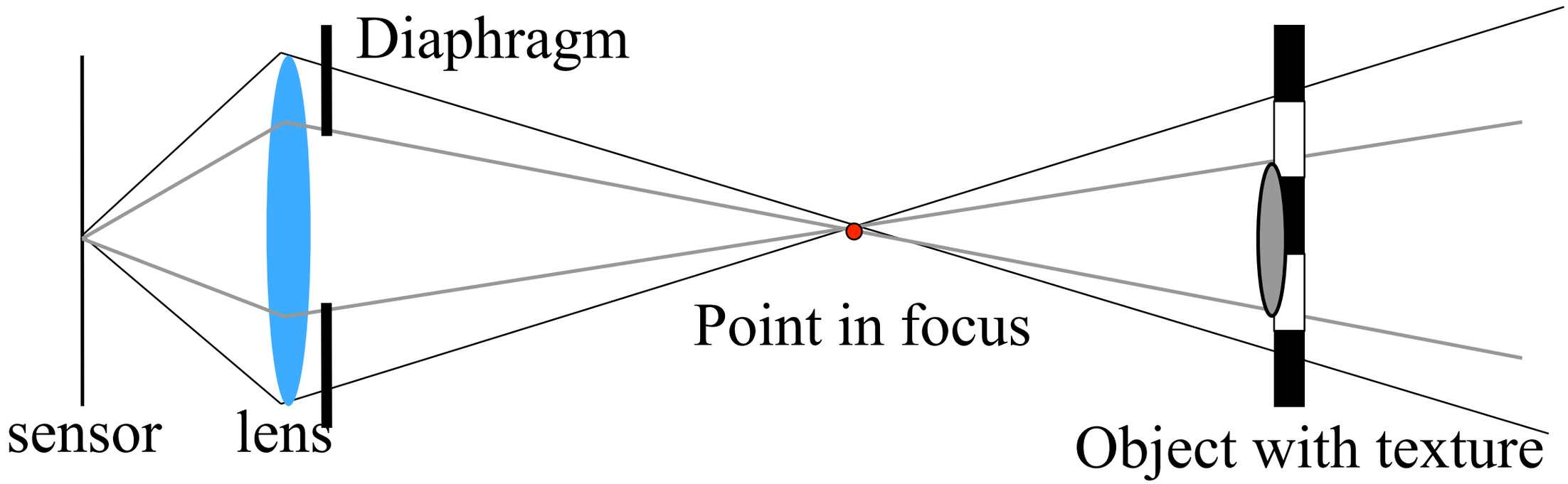
Depth of field



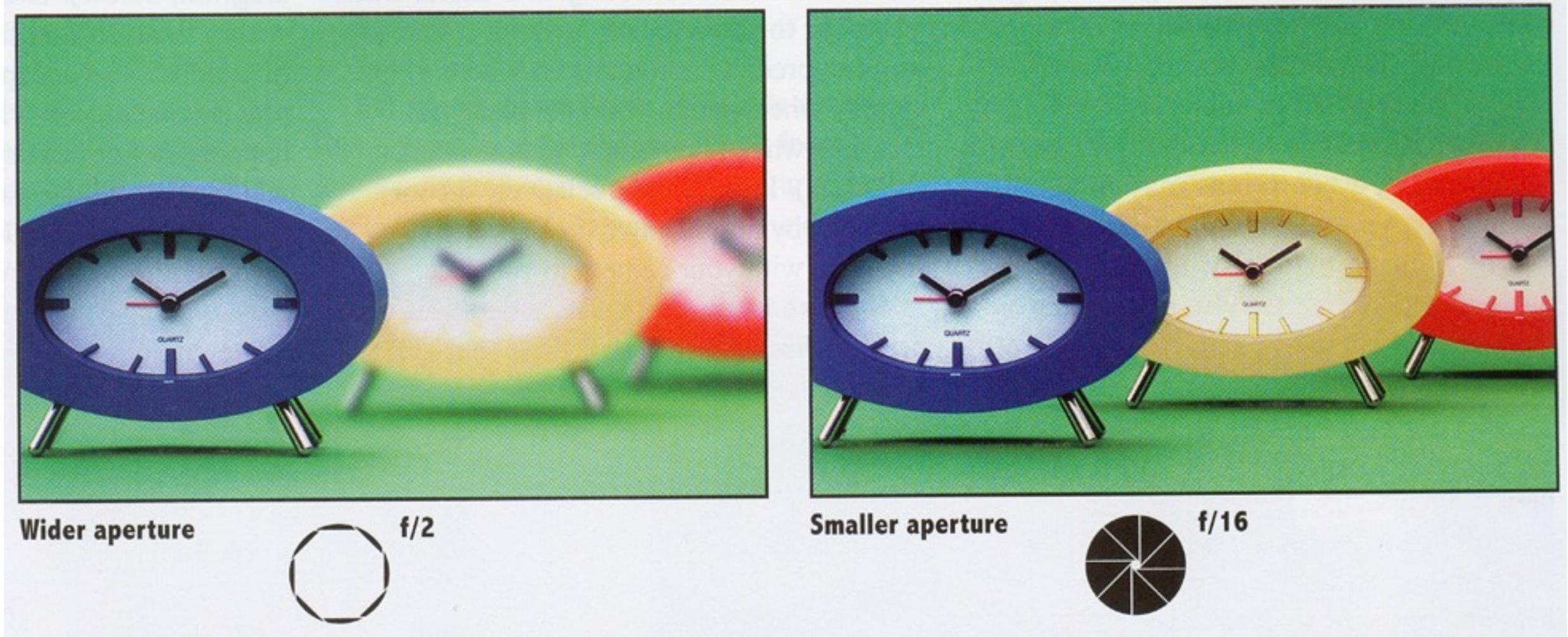


Depth of field

- **What happens when we close the aperture by two stop?**
  - Aperture diameter is divided by two
  - Depth of field is doubled



Depth of field



From Photography, London et al.

Is depth of field good or evil?

- **It depends, little grasshopper**
- **Want huge DoF: landscape, photojournalists, portrait with environment**
- **Shallow DoF: portrait, wildlife**

Michael Reichman

Steve McCurry

Shallow depth of field: portrait

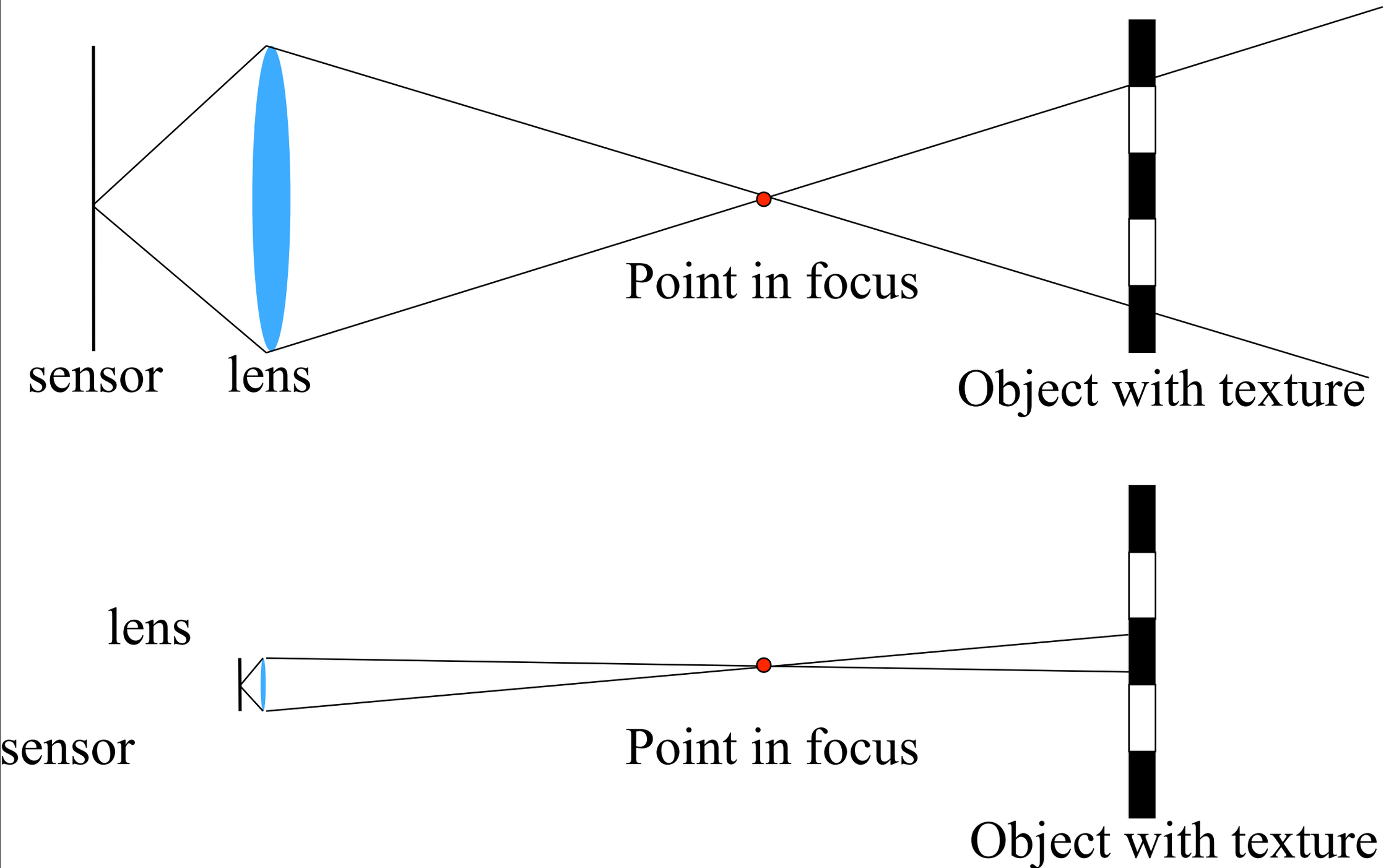
85mm f/1.2

Depth of field to isolate, focus

105mm f/4 (but focused close)

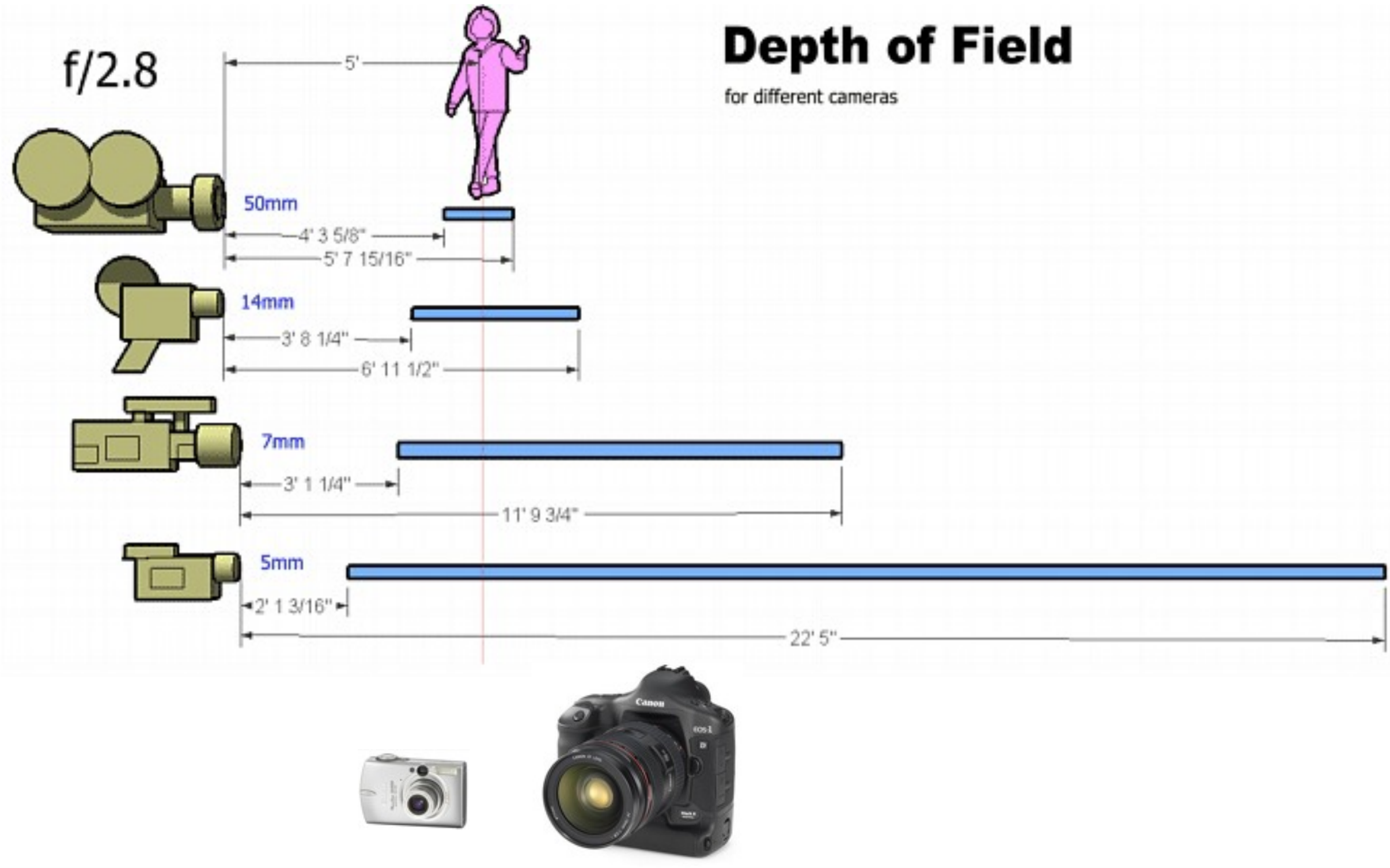
Depth of field

- **It's all about the size of the lens aperture**



Sensor size

- http://www.mediachance.com/dvdlab/dof/index.htm



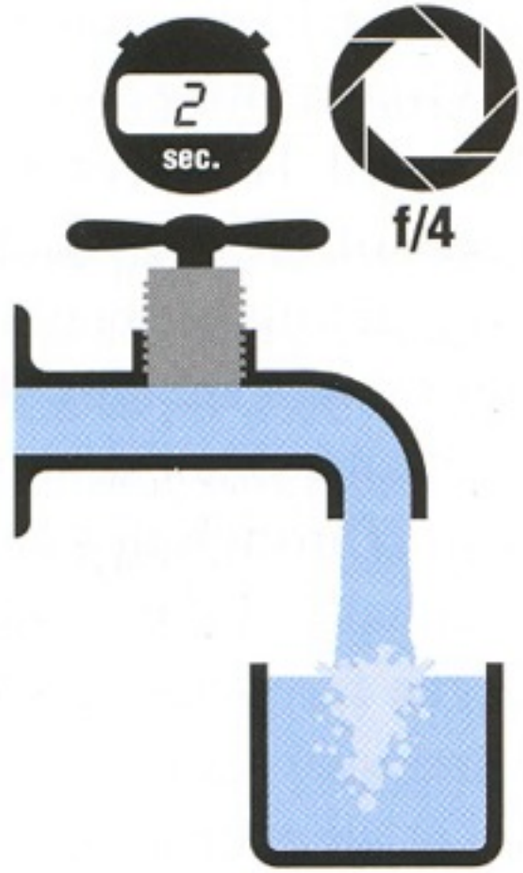
Exposure

- **Two main parameters:**
  - Aperture (in f stop)
  - Shutter speed (in fraction of a second)

- **Reciprocity**

The same exposure is obtained with an exposure twice as long and an aperture *area* half as big

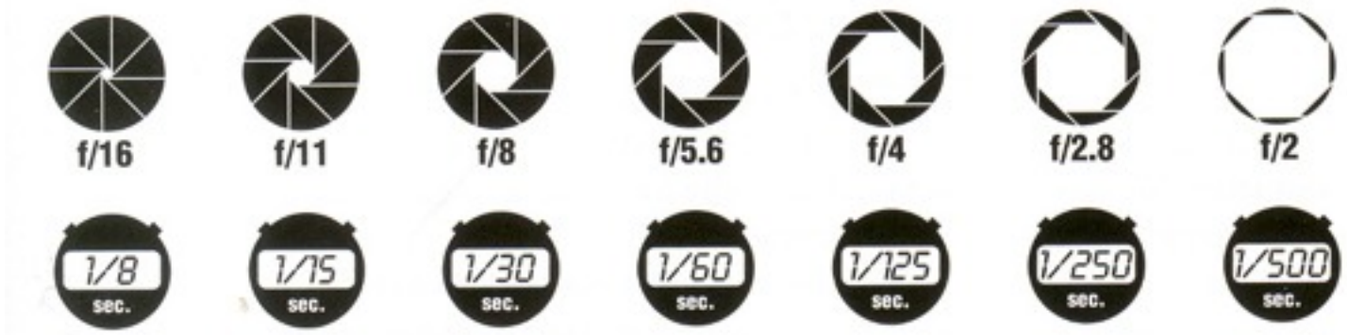
  - Hence square root of two progression of f stops vs. power of two progression of shutter speed
  - Reciprocity can fail for very long exposures



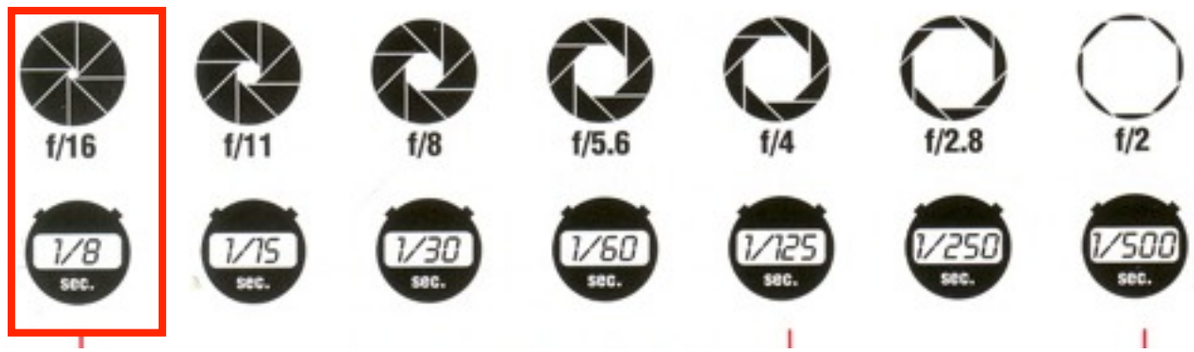
From Photography, London et al.

Reciprocity

- **Assume we know how much light we need**
- **We have the choice of an infinity of shutter speed/ aperture pairs**

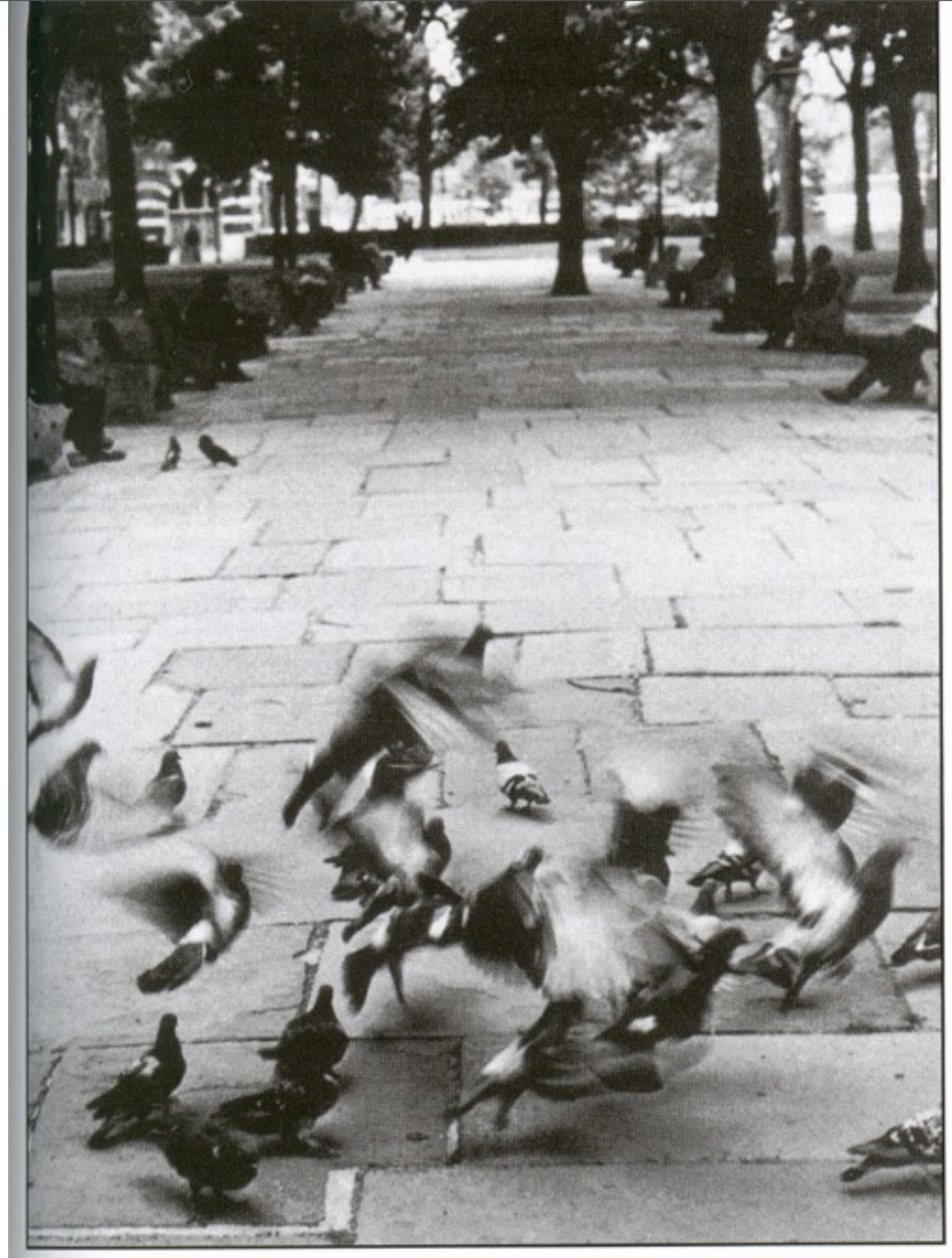


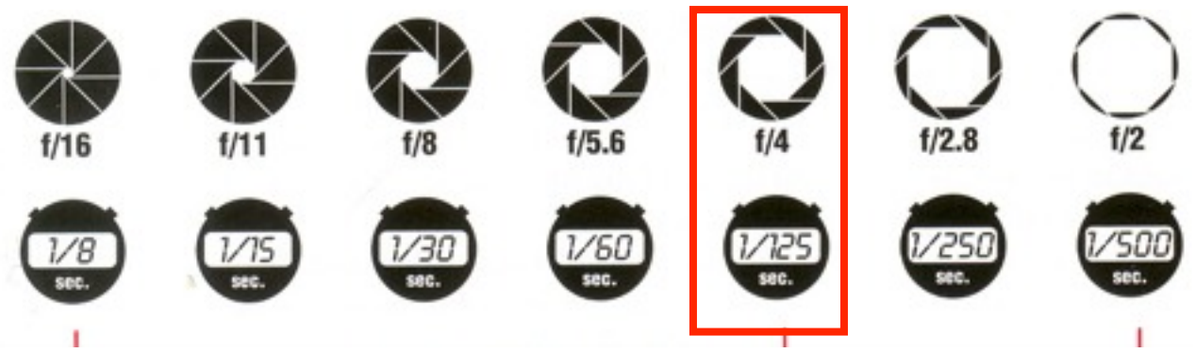
- **What will guide our choice of a shutter speed?**
  - Freeze motion vs. motion blur, camera shake
- **What will guide our choice of an aperture?**
  - Depth of field, diffraction limit
- **Often we must compromise**
  - Open more to enable faster speed (but shallow DoF)



Small aperture (deep depth of field), slow shutter speed (motion blurred). *In this scene, a small aperture (f/16) produced great depth of field; the nearest paving stones as well as the farthest trees are sharp. But to admit enough light, a slow shutter speed (1/8 sec) was needed; it was too slow to show moving pigeons sharp. It also meant that a tripod had to be used to hold the camera steady.*

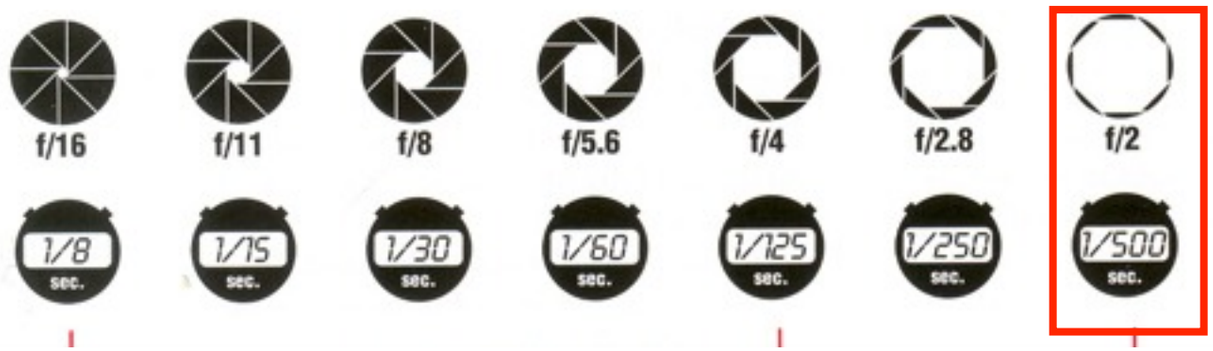
From Photography, London et al.





Medium aperture (moderate depth of field), medium shutter speed (some motion sharp). *A medium aperture (f/4) and shutter speed (1/125 sec) sacrifice some background detail to produce recognizable images of the birds. But the exposure is still too long to show the motion of the birds' wings sharply.*

From Photography, London et al.

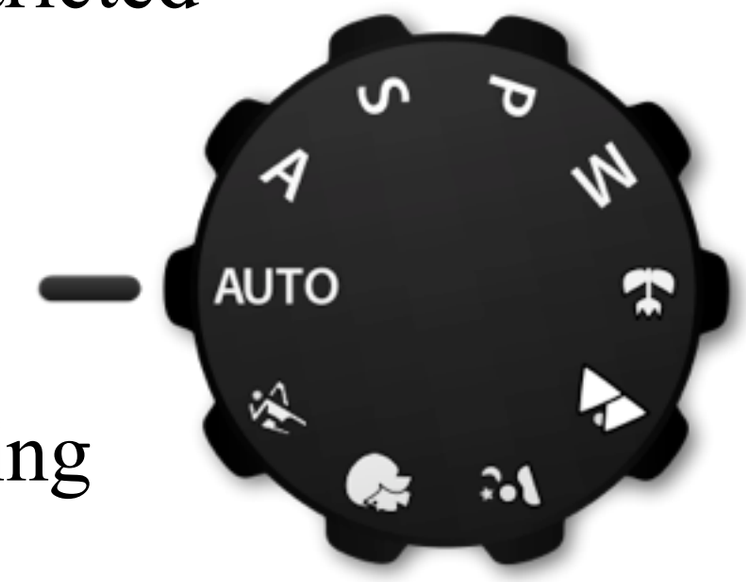


Large aperture (shallow depth of field), fast shutter speed (motion sharp). *A fa*
shutter speed (1/500 sec) stops the motion of the pigeons so completely that the
flapping wings are frozen. But the wide aperture (f/2) needed gives so little depti
of field that the background is now out of focus.

From Photography, London et al.

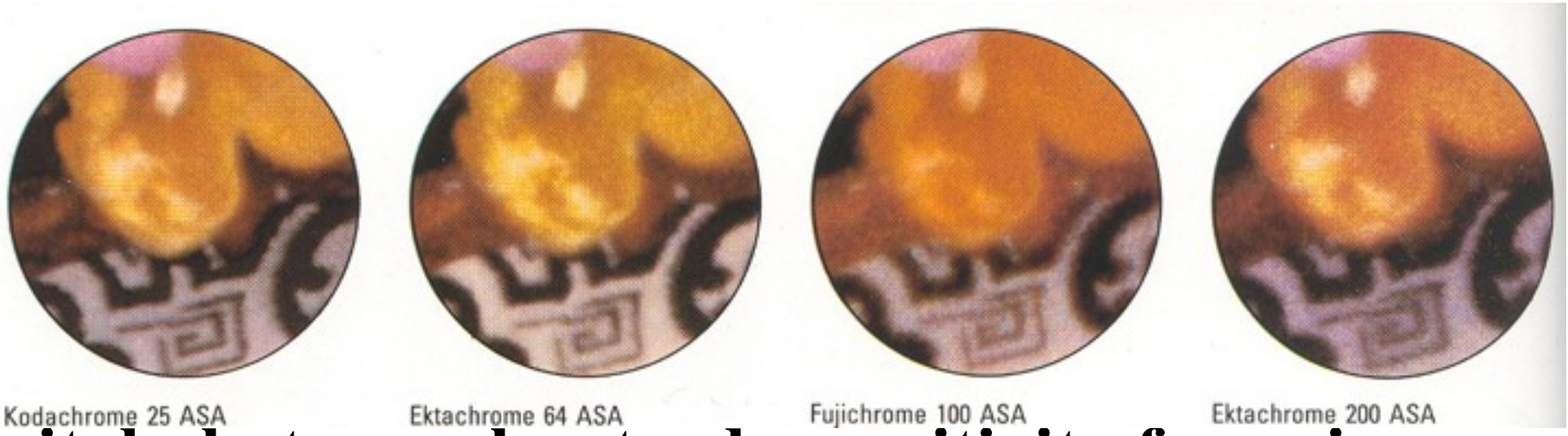
Pros and cons of various modes

- **Aperture priority (My favorite, I use it 90% of the time)**
  - Direct depth of field control
  - Cons: can require impossible shutter speed (e.g. with f/1.4 for a bright scene)
- **Shutter speed priority (Tv or S)**
  - Direct motion blur control
  - Cons: can require impossible aperture (e.g. when requesting a 1/1000 speed for a dark scene)
    - Note that aperture is somewhat more restricted
- **Program**
  - Almost no control, but no need for neurons
- **Manual**
  - Full control, but takes more time and thinking

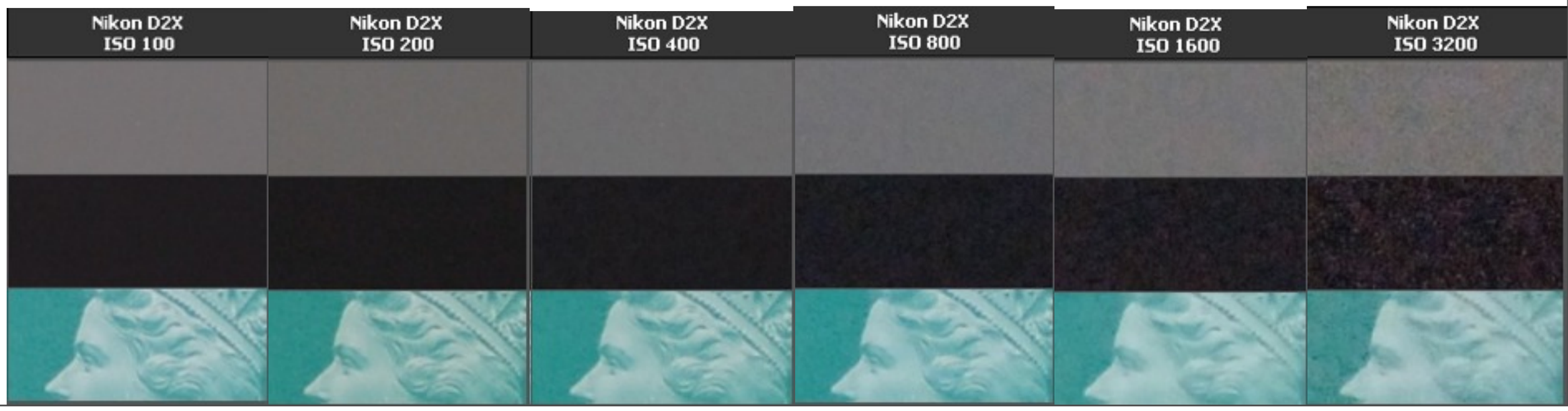


Sensitivity (ISO)

- **Third variable for exposure**
- **Linear effect (200 ISO needs half the light as 100 ISO)**
- **Film photography: trade sensitivity for grain**



- **Digital photography: trade sensitivity for noise**
  - Gain

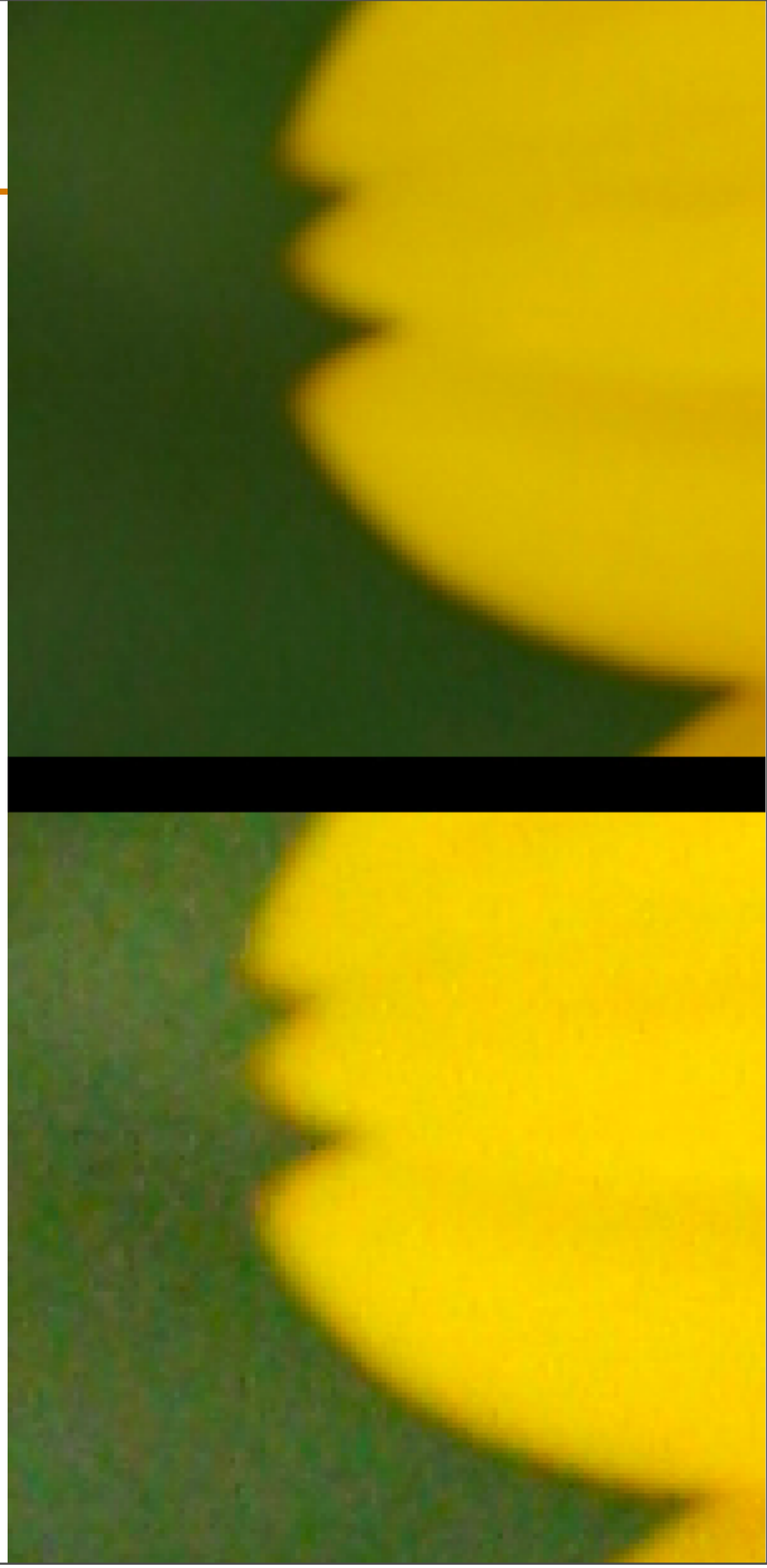


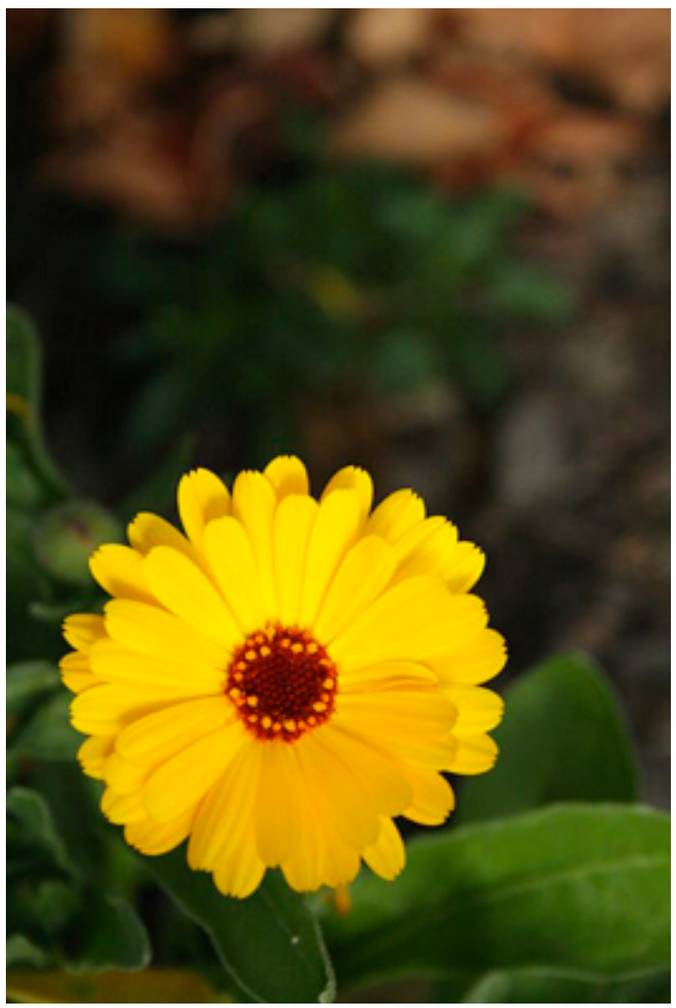
From dpreview.com

ISO amplifies noise

- **http://en.wikipedia.org/wiki/File:ISO_comparison_150px.jpg**

ISO 100





ISO 1600

Canon 400D

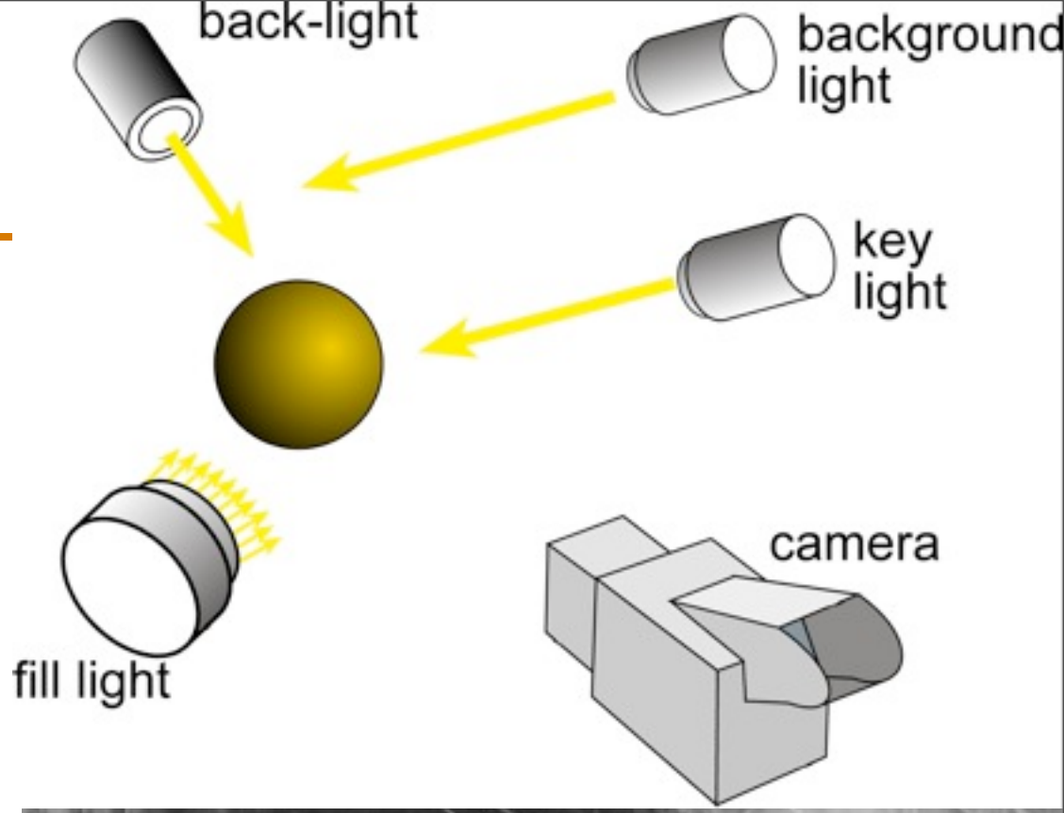
Noise summary

- **Bigger pixels mean less noise**
- **Better electronics means less noise**

- **Use a low ISO whenever possible**

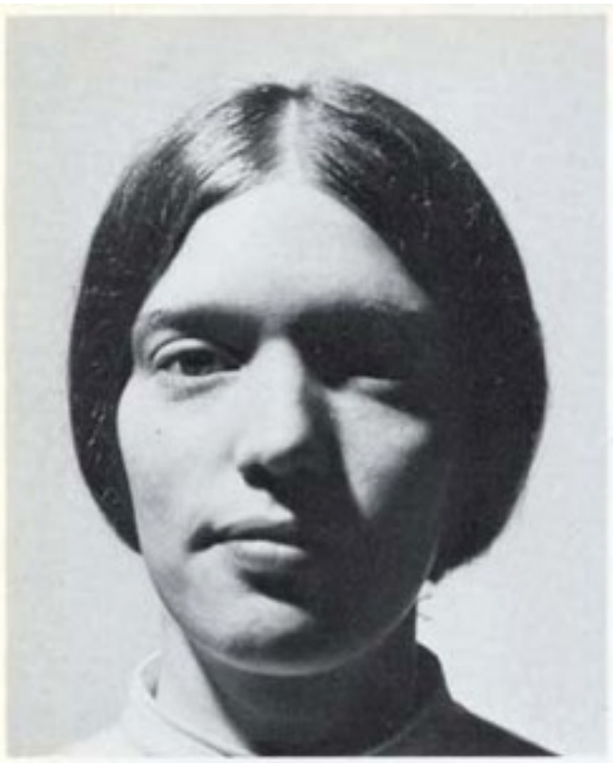
Lighting

- **E.g. 3-point lighting**
  - Reduce dynamic range
  - Emphasize silhouettes
    =>3D cues



- **Goals of lighting:**
  - Manage dynamic range
  - Reveal shape, layout, material
  - Tell story

Portrait lighting



Main light

Fill-in light

Accent light

Background light

Fill flash

- **but set to -2EV (flash compensation, darker by a factor of 4)**

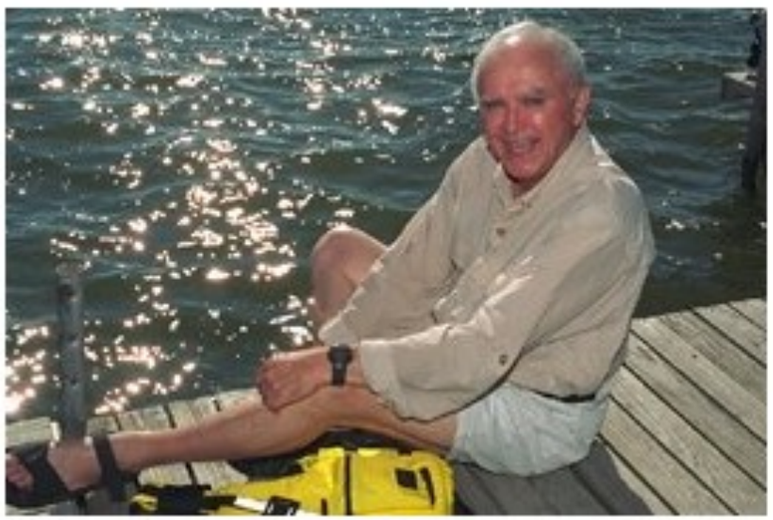
3 Use flash outdoors

Bright sun can create unattractive deep facial shadows. Eliminate the shadows by using your flash to lighten the face. When taking people pictures on sunny days, turn your flash on. You may have a choice of fill-flash mode or full-flash mode. If the person is within five feet, use the fill-flash mode; beyond five feet, the full-power mode may be required. With a digital camera, use the picture display panel to review the results.

On cloudy days, use the camera's fill-flash mode if it has one. The flash will brighten up people's faces and make them stand out. Also take a picture without the flash, because the soft light of overcast days sometimes gives quite pleasing results by itself.

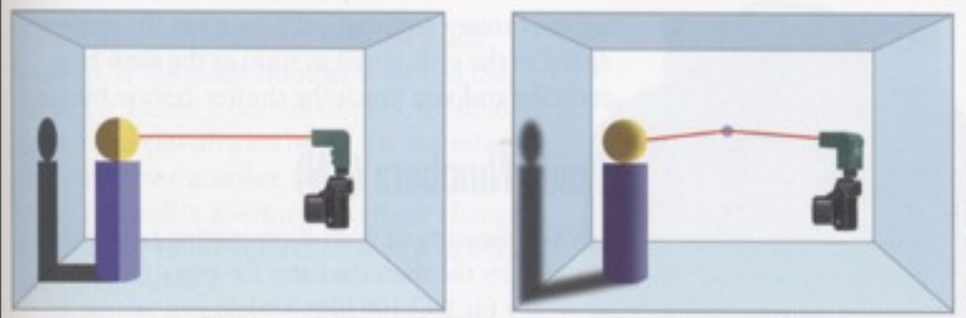
- Learn more about composing people pictures

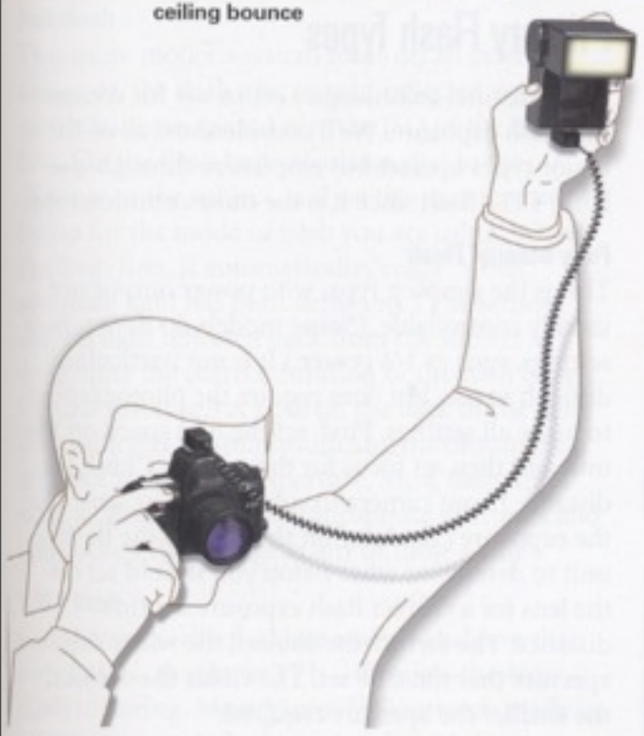
Subject is dark



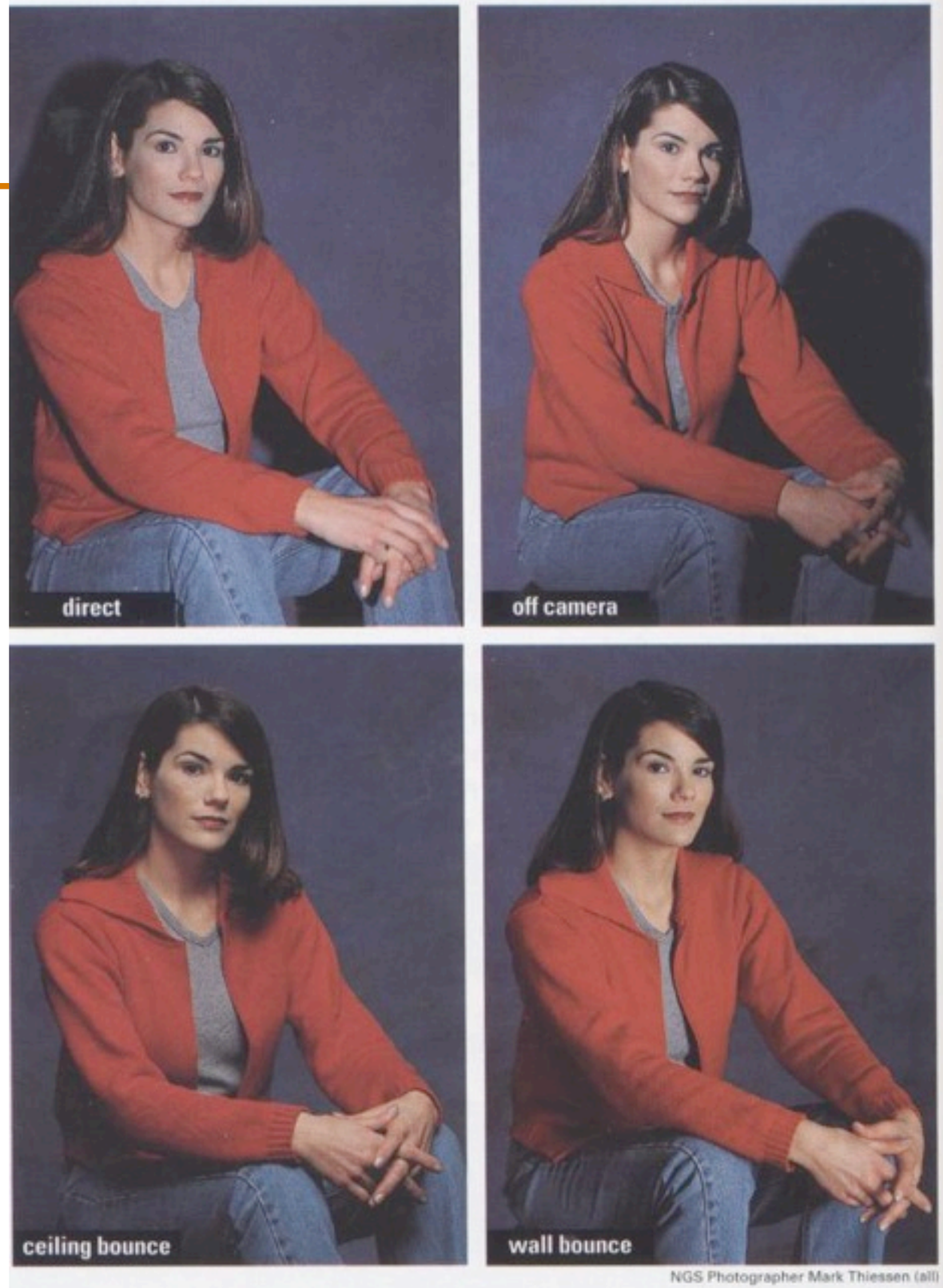
After

http://www.kodak.com/eknec/PageQuerier.jhtml?pq-path=317&pq-locale=en_US





Illustrated here are the lighting effects produced by **direct, wall bounce, ceiling bounce, and off-camera direct flash.** The location and quality of the subject's shadow changes, depending on the flash technique used. Direct flash, although sometimes necessary, produces a harsh image. Bounce flash produces softer light and softer shadows. Wall-bounce flash is similar to ceiling bounce flash with the added benefit of better revealing the subject's shape.



NGS Photographer Mark Thiessen (all)

Direct, on-camera flash is harsh and unflattering. Removing the flash from the camera, or bouncing the flash light from a nearby surface produces different effects. Light bounced from a ceiling, although commonly used, causes dark shadows in the eye sockets and under the nose and chin. The most successful technique indoors is to bounce light from a nearby light-colored wall.

National Geographic Photography field guide

Flash Diffuser

- **Two tricks:**
  - diffuser illuminates the whole room, light is very diffuse
  - diffuser is orange and matches ambient light

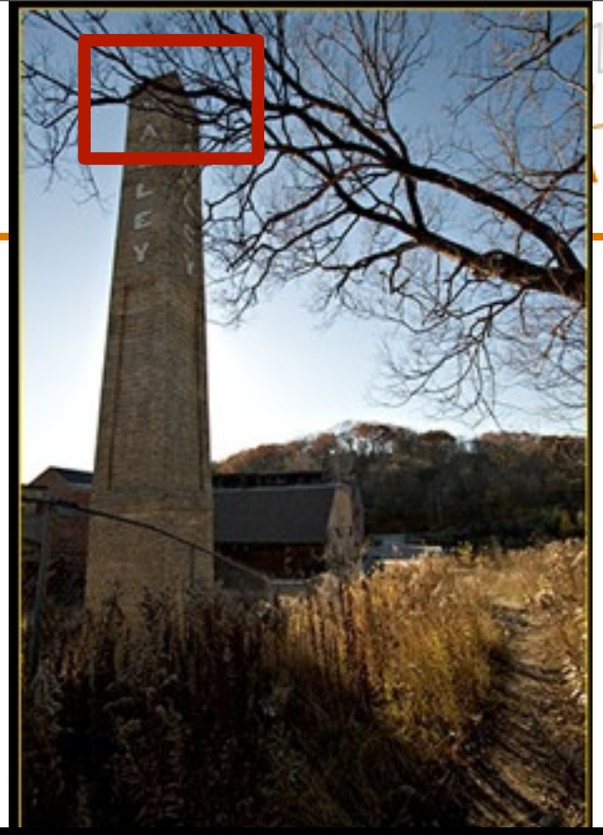
Equipment

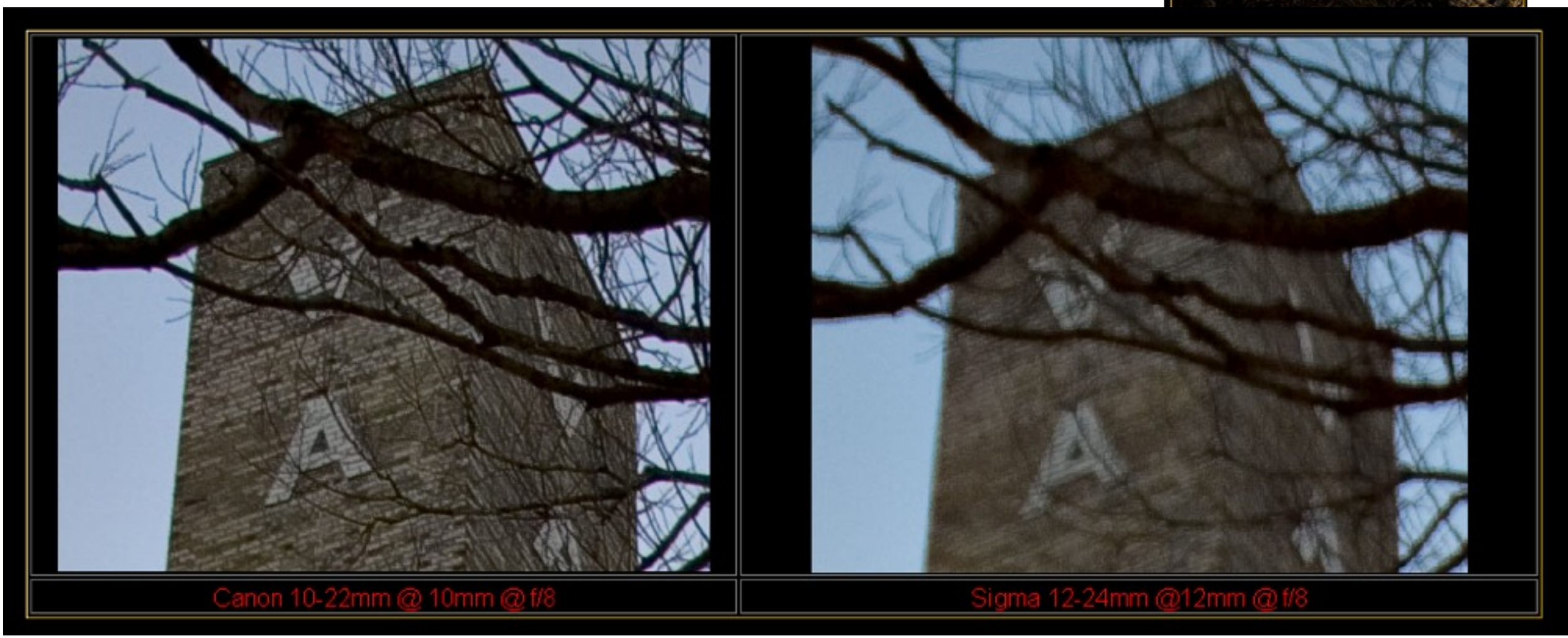
Fredo Durand
MIT CSAIL

Choosing a camera

- If you can afford it, get an SLR
  - bigger sensor = less noise in low light
  - bigger sensor = shallower depth of field
  - faster autofocus
  - more lens choice, higher optical quality
- Do not worry about
  - megapixels - 6 is way enough
  - brand - they're all good enough
  - body - they all have the same image quality
- Worry about lenses

Lens quality varies!

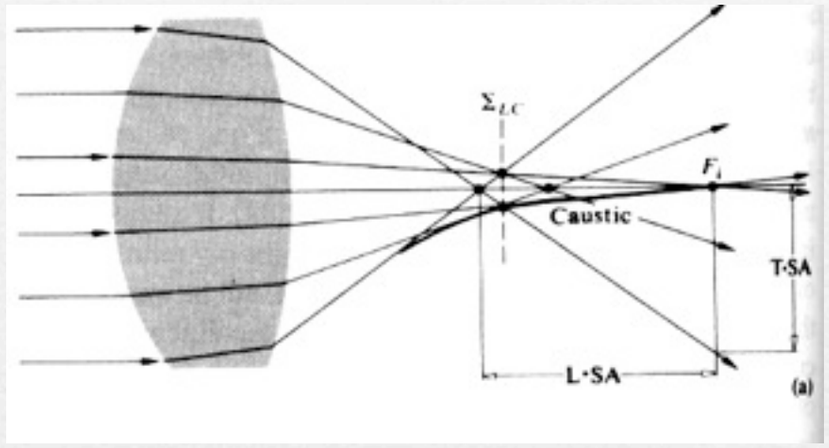




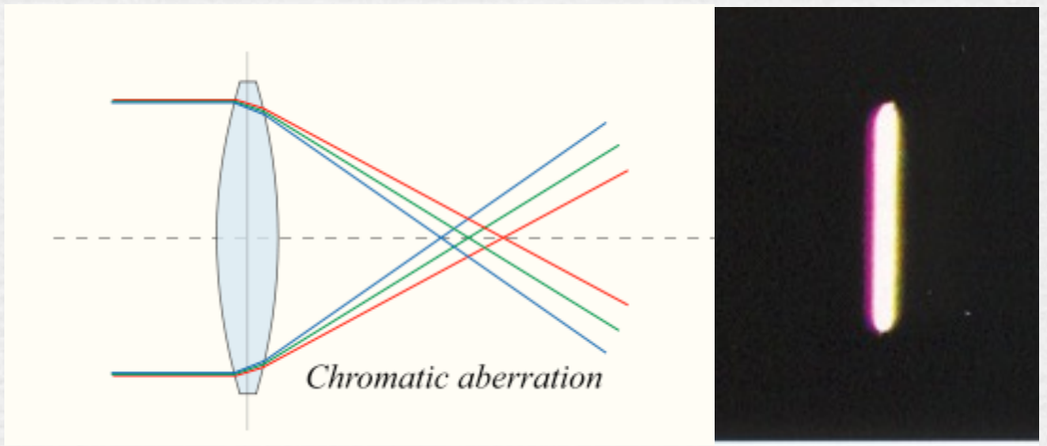
source: the luminous landscape

Typical lens issues

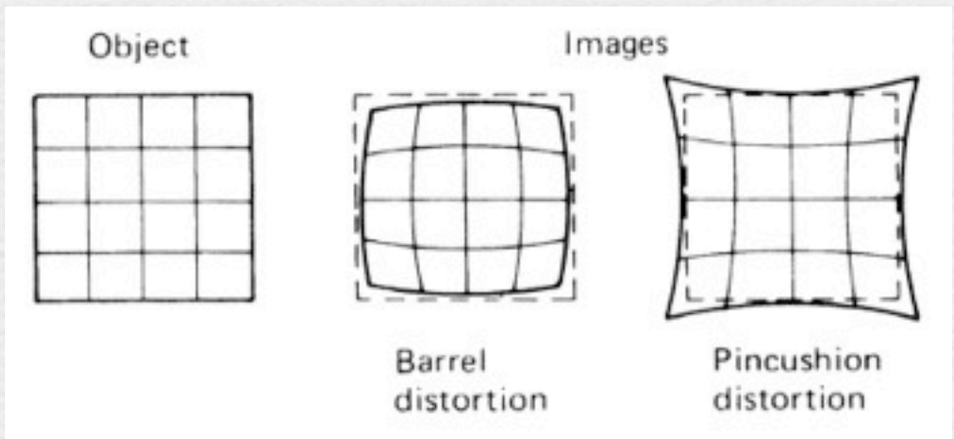
- Spherical aberrations
  - rays don't all converge



- Chromatic aberration
  - different wavelength don't converge as well



- Barrel distortion
  - straight lines look curved



Chromatic aberration

- Good lens

- Lens with severe chromatic aberration

http://upload.wikimedia.org/wikipedia/commons/6/66/Chromatic_aberration_(comparison).jpg

Zoom vs. prime

- **The left image is with an expensive zoom**
- **Still softer than the prime on the right**

Canon 100-400mm f/3.5-f/5.6L zoom @ f/5.6

Canon 400mm f/5.6L @ f/5.6

source: the luminous landscape

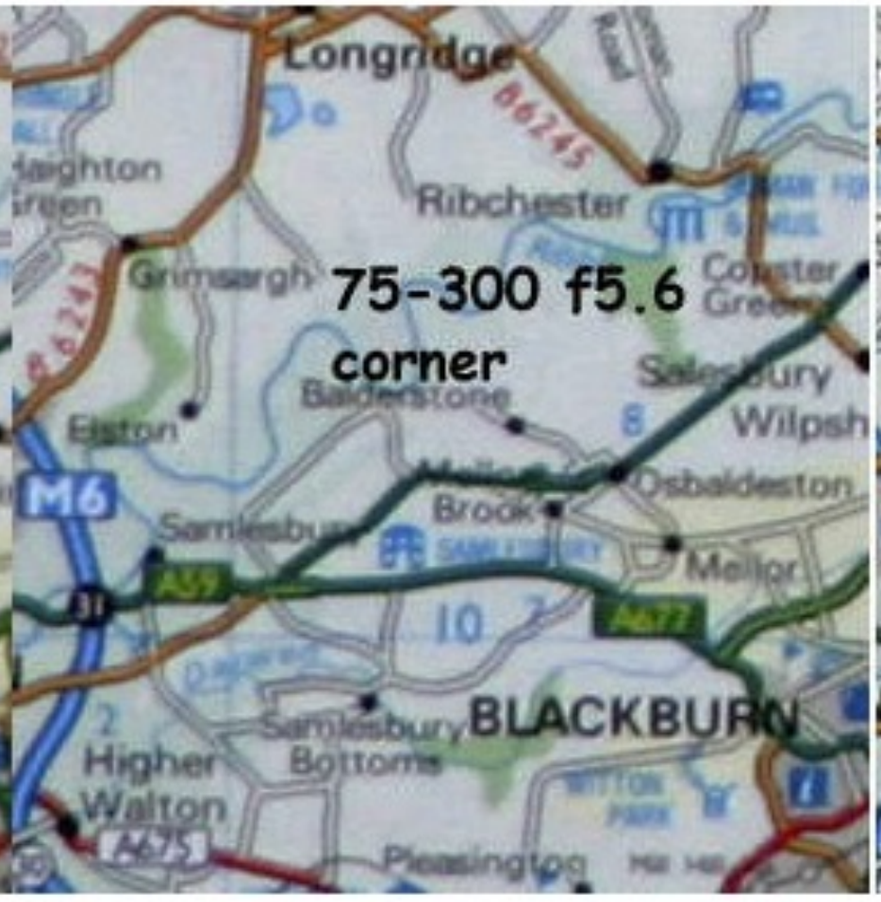
Center is usually OK

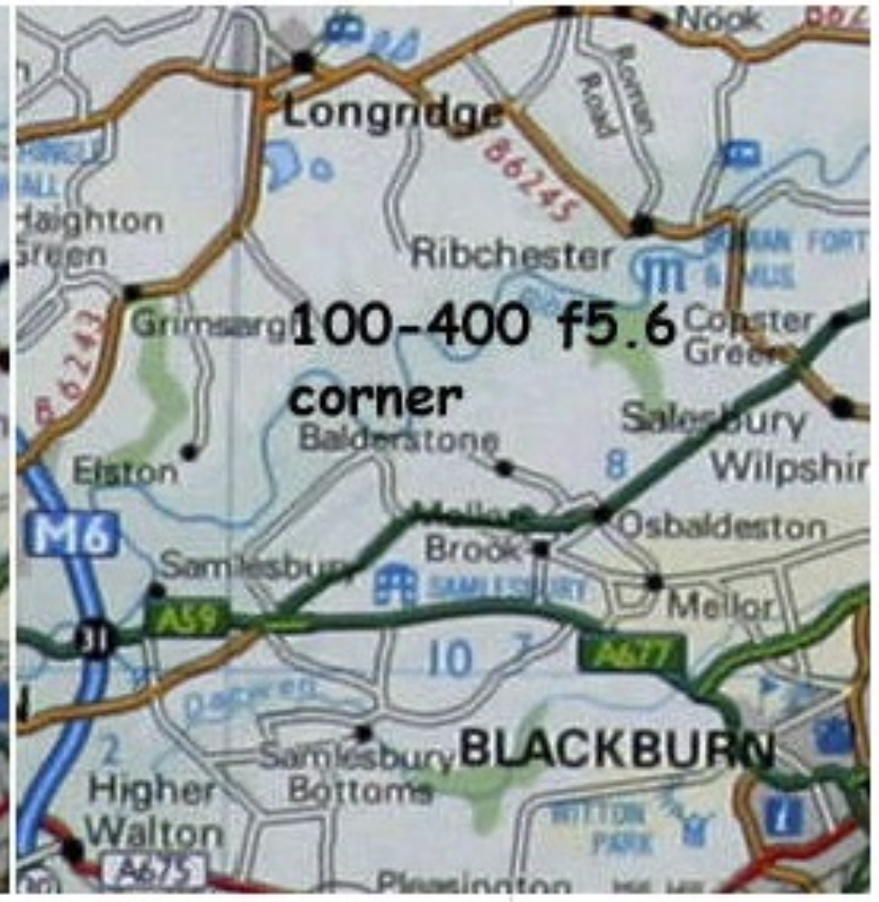
- **http://www.photo.net/equipment/canon/70-300do_2/**

250x500 pixel crops, centre of frame f5.6

Image corners are often sacrificed

- **http://www.photo.net/equipment/canon/70-300do_2/**





250x500 pixel crops, corner of frame f5.6

Max aperture is tough

- **http://www.photo.net/equipment/canon/70-300do_2/**

250x500 pixel crops, centre of frame f5.6

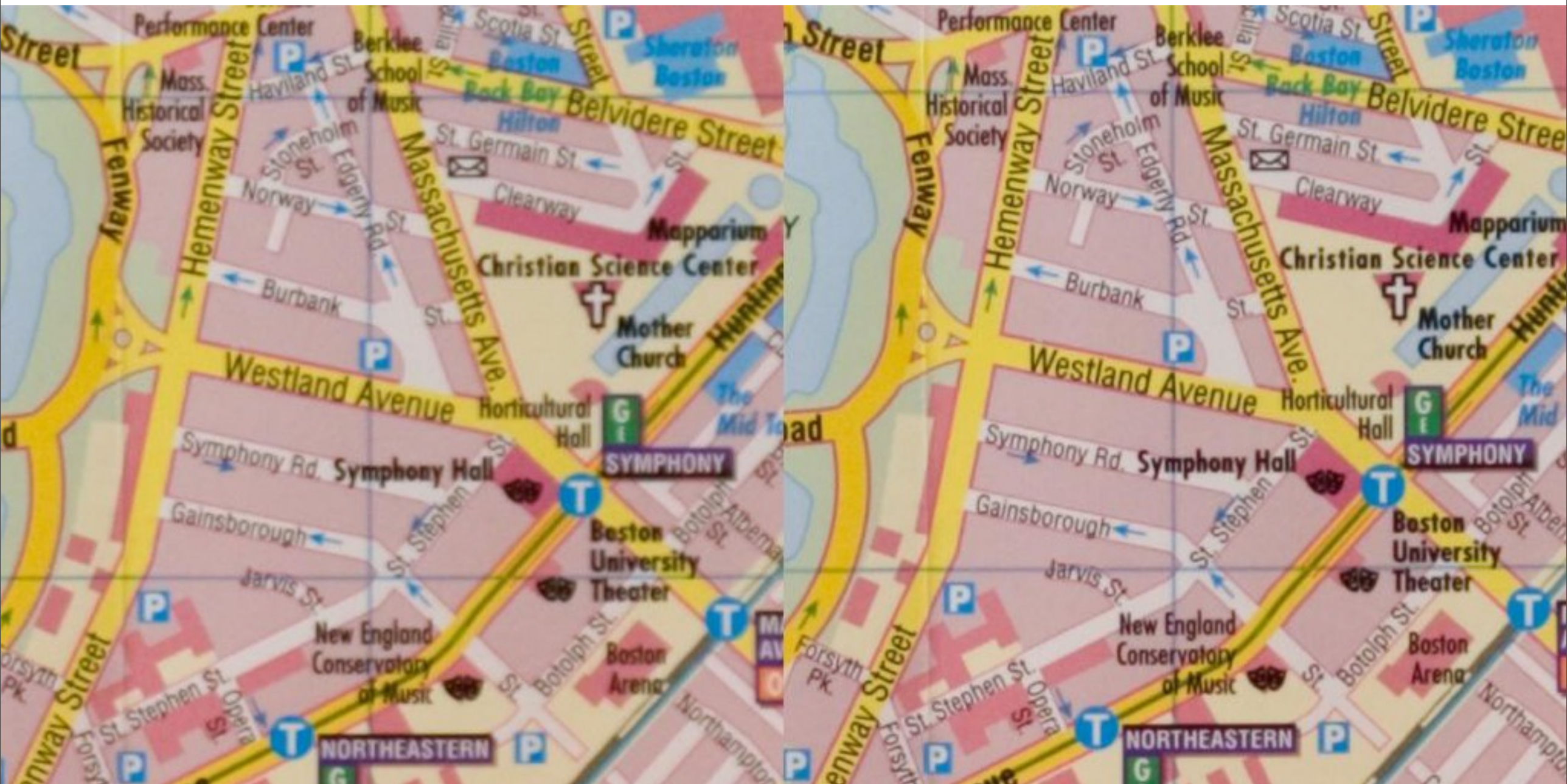
Gets better when stopped down

- **http://www.photo.net/equipment/canon/70-300do_2/**

250x500 pixel crops, centre of frame f11

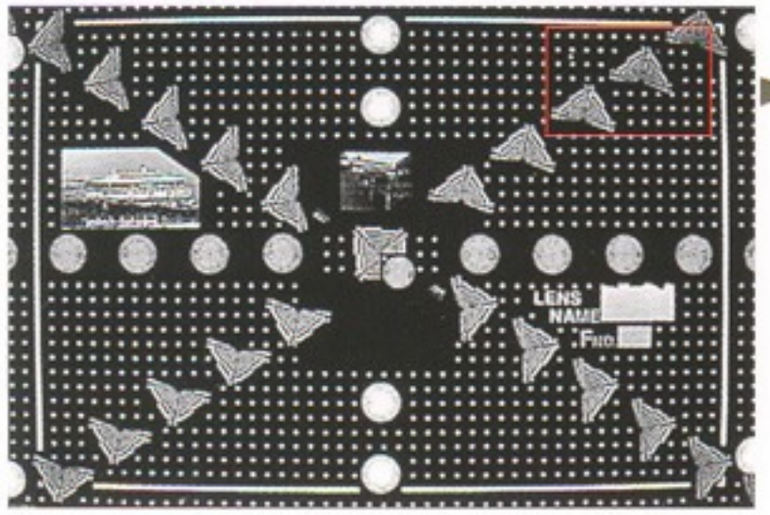
Copy variation

- **Left: Addy's 100-400; Right: Frédo's**
- **(full aperture, 135mm)**

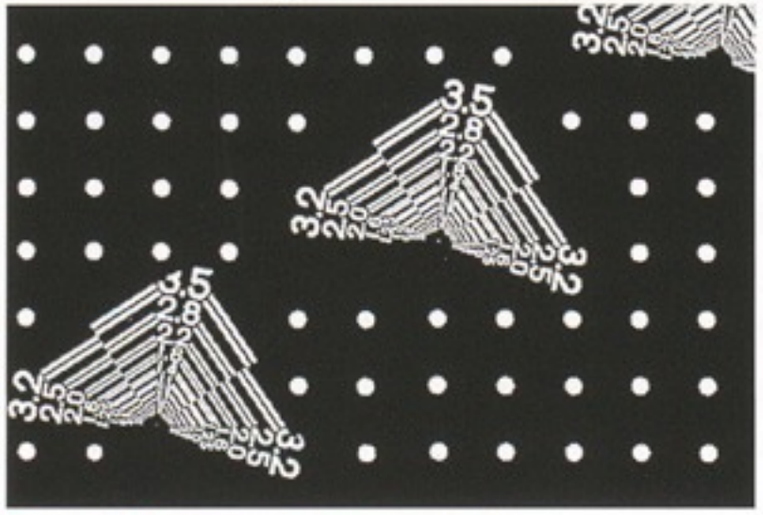


Defects

Photo-2 The photographs are magnifications of the subject and surrounding area from part of a test chart photographed with a 24mm x 36mm film frame and printed on quarter size paper.

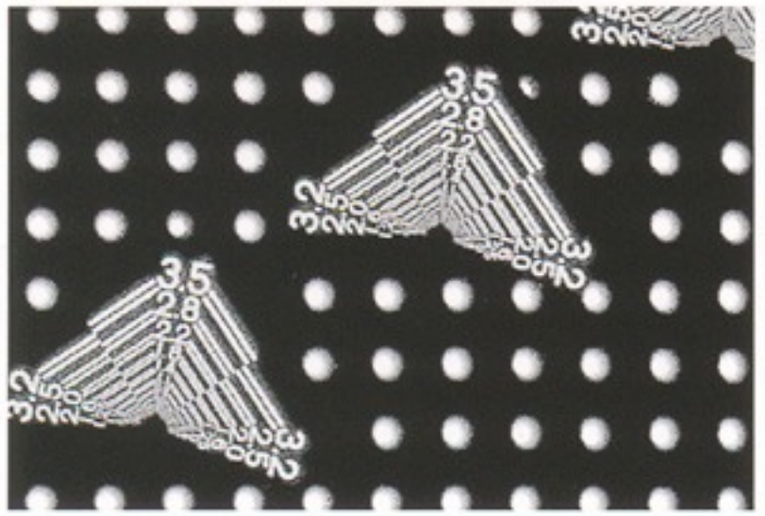


Almost ideal image formation

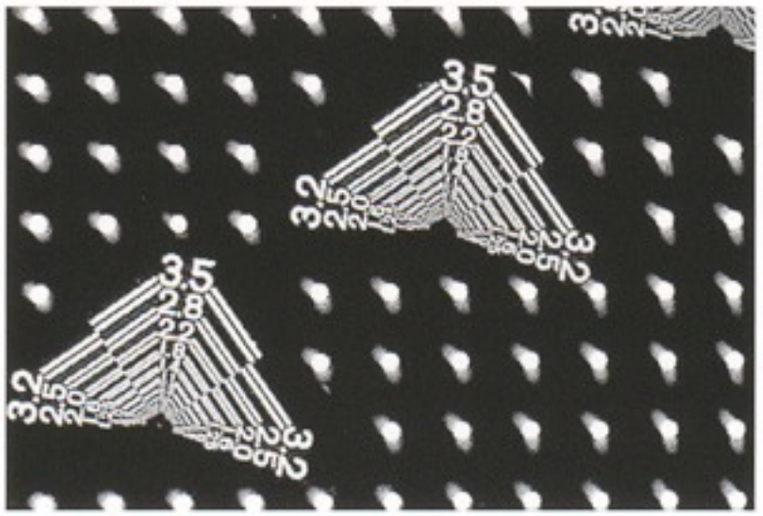


Paripheral ▭ part magnified

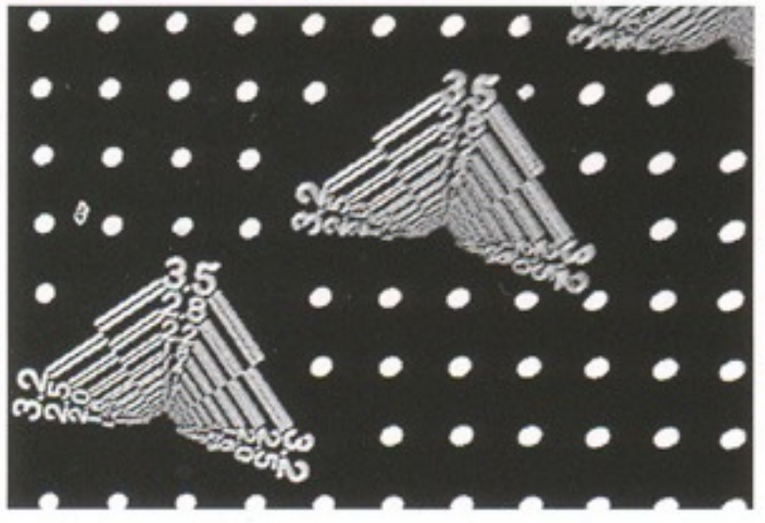
① Example of spherical aberration



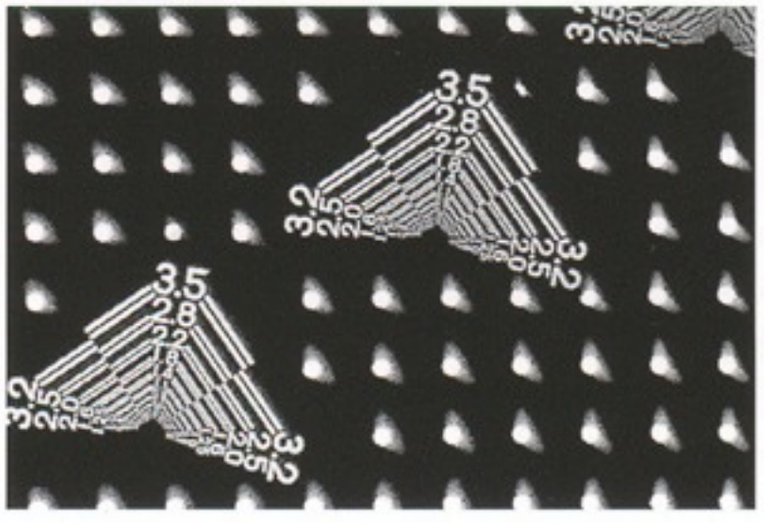
②-1 Example of inward coma



③ Example of astigmatism



②-2 Example of outward coma



source: canon red book

Online reviews

- **http://www.slrgear.com/reviews/index.php**
- **http://www.dpreview.com/lensreviews/**
-

Equipment

- **Do get an SLR, compacts are too limited**
- **Don't worry about brand (with a bias for Nikon/Canon)**
- **Don't worry about the body, get the cheapest one**
- **Worry about lenses**
  - Zooms are convenient but quality can be a problem
    - Avoid the basic zoom, but the one above is usually great
    - Avoid large range (e.g. 18-200) they're not bad when stopped down, but quality isn't great at full aperture
    - Maximum aperture matters (the smaller the number, the better)
  - Get a prime in the 35-85mm range (cheap, high quality, wide aperture) 50mm f/1.8
- **Count $500 to 1k for basic configuration**

Equipment

- **Get a tripod**
  - important for landscape, cityscape
  - get a good one: stability is important
- **Good flash photography is very difficult!**
  - Because you typically deal with 2 sources of light: flash and ambient
  - You need to get the exposure right for both!
  - You need to get the white balance right for both!
- **Get an external flash if you want to take "event" pictures**
  - The built-in flash is only good for fill flash (in bright sunlight)
  - Use external flash, orient towards (white) wall/ceiling
  - Get a diffuser (omnibounce)
  - Get yellow gel (or diffuser) to match indoor lighting

Why use flash / lighting

- **Supplement light**
- **Reduce excessive contrast**
- **Set the mood**

Nikon

Tends to be a tad cheaper

- **D40 & D60 are good. D90 if you want to be more serious**
- **18-70**
- **55-200 is surprisingly not so bad and super cheap**
- **Get the 50mm f/1.8**

Canon

- **Rebel T1i or Xs for cheap options, 40D for more control, 5DII if your bank account permits**
- **17-85**
- **70-200 f/4.0 (amazing lens)**
- **50mm f/1.8**
- **100mm f/2.8 macro (great also for portraits)**

- **older cameras: as old as 20D (before that, noise is not as good)**

Other brands

Not as big a range, future not always clear (see Minolta), have been slower to get to digital SLR

- **Olympus**
  - Good system, but smaller sensor
- **Pentax**
  - Good entry camera
- **Sigma**
  - Intriguing sensor (Foveon), limited system, noise is an issue
- **Fuji**
  - One-trick pony (the sensor)
  - Nikon body
- **Sony**
  - Pretty good.
  - Lens selection not as good as Nikon/Canon

For portraits

- 50mm f/1.8
- external flash + diffuser

- Extra goodies
  - wide angle lens for environmental portrait
  - reflector
  - second flash if you want to be serious about lighting
  - medium telephoto if you like formal portraits or larger working distances (70-200, ideally f/2.8 but they're expensive)
    - alternative: 85mm f/1.8, 100mm f/2

Landscape, cityscape

- Standard zoom, wide enough (24mm equivalent, meaning 17mm on most affordable SLRs)
- Good sturdy tripod + remote trigger
- Medium telephoto (e.g. 55-200 or 70-200) to isolate details
- Polarizing filter

Events (parties, wedding)

- Wide angle to show context and fun shots
- Medium telephoto for candids
- 50mm f/1.8 for available-light photo
- Flash (but used as bounce) + diffuser

Wildlife

- you need at least 400mm equivalent (300mm is fine on smaller sensors)
- For birds: flash + better beamer

Macro

- 100mm macro or 60mm macro lens (1:1 magnification)
- Sturdy tripod + remote trigger
- Lighting equipment
  - reflector / diffuser (DIY)
  - flash or some external light
  - lots of DIY options

Shooting

- **Use aperture priority, work on depth of field**
- **Change your viewpoint**
- **Don't center things**
- **Pay attention to background**

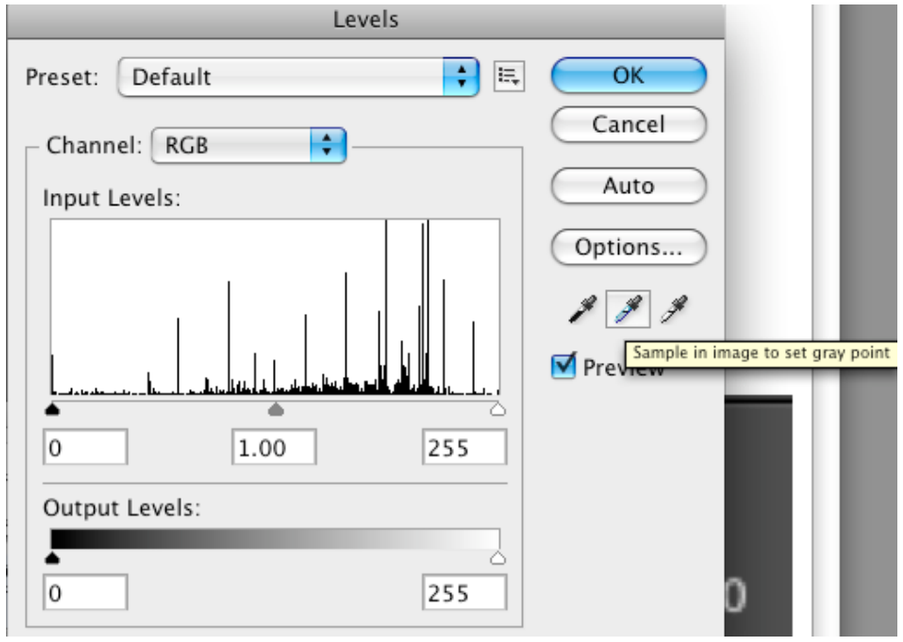
- **Shoot raw**
- **Check your histogram**
  - to make sure you expose properly

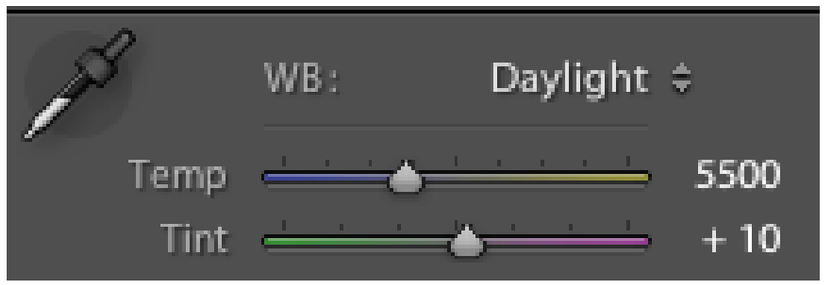
Software

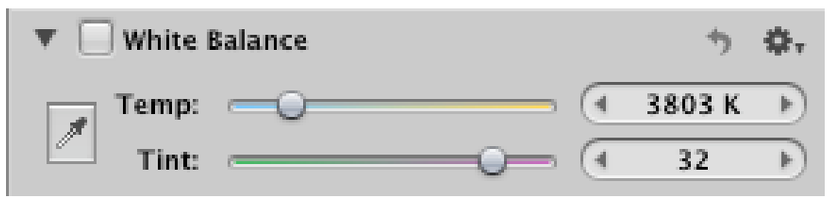
- **Photo management & lightweight editing**
  - –Lightroom, Aperture, Lightzone
- **Fix white balance**
- **Crop to improve composition**
- **Manage contrast using curve a**
- **Boost saturation (or vibrance) a little.**
  - –SLRs tend to be neutral
- **Add light to dark areas (fill light)**
- **Sharpen a bit**
- **Convert to black and white**
- **Use Photoshop only if you really need to**

Lightroom white balance demo

- Most photo editing software lets you click on a neutral object to achieve white balance
- In “Levels” in Photoshop
- In “basic” in Lightroom
- In Adjustments in Aperture
- You also often have presets such as daylight, tungsten







Party name tags

- Provide excellent white references!

Improving your pictures

Fredo Durand
MIT CSAIL

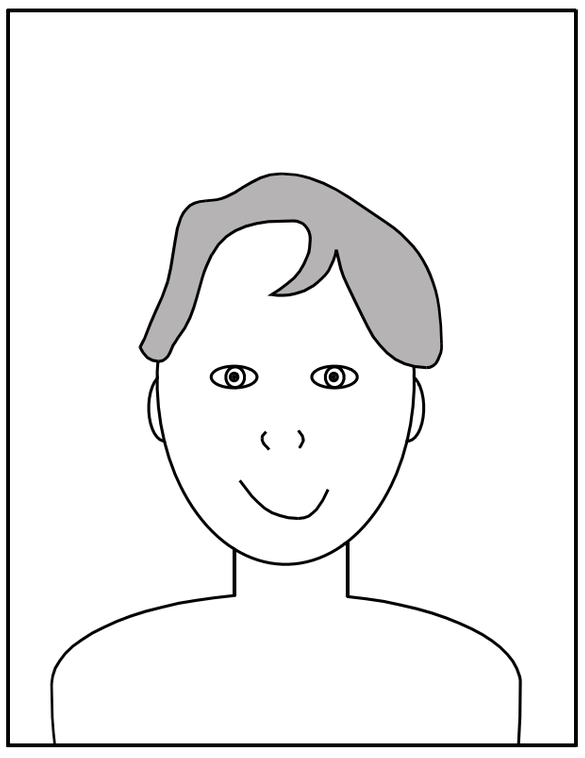
Advice overview

- **Follow rules or really break them. No middle ground.**
- **Simplify, avoid cluttered background**
  - move your viewpoint, frame tighter, shallow depth of field, desaturate
- **Don't center things**
  - rule of the third, leave space for gaze or motion
- **Avoid harsh light**
  - golden hours, overcast days, avoid direct sunlight, go in the shade, fill flash, bounce flash, post-processing
- **White balance**
- **Portraits are all about the eyes**
  - get them sharp, be at eye level

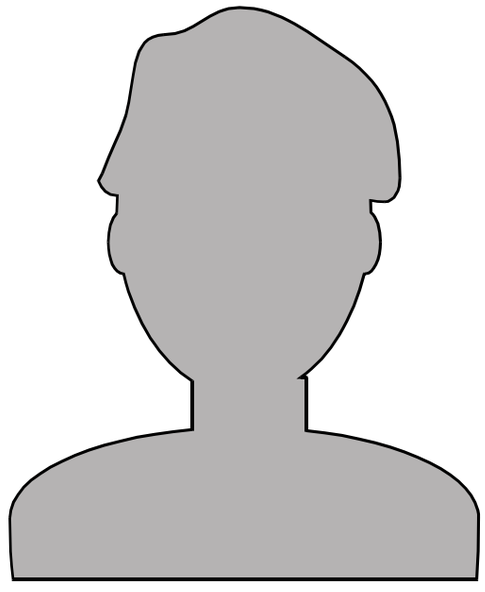
Background

Negative space

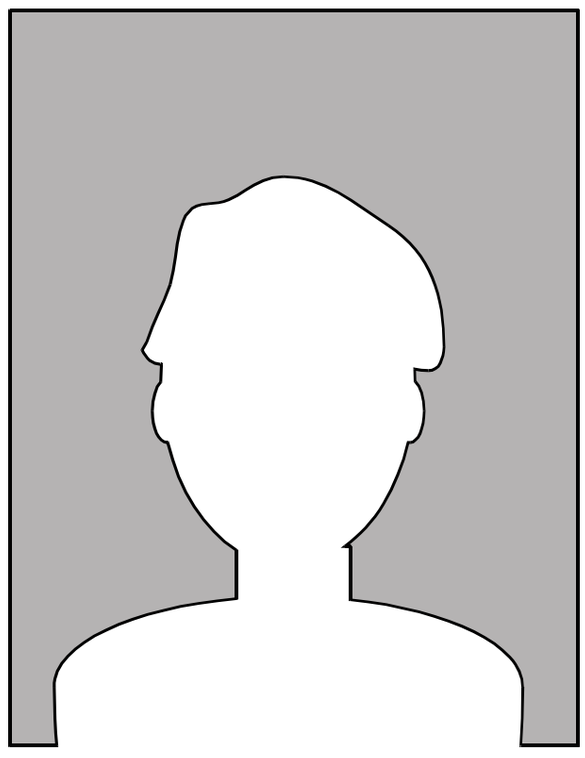
- **The ground defines the negative space**
- **Usually overlooked**
- **Fundamental for balance**
  - Also for typography



picture



figure



negative space

Avoid cluttered background

- **Move your feet**

Avoid Cluttered Backgrounds
Don't let a cluttered background overwhelm or obscure your subject. Move around, or lie down, to get a clear shot at your subject without the distractions.

A cluttered background can obscure your main subject

Reposition your subject or yourself

Distracting background

Model: Rob Wang

Move your feet! (1 meter away)

Model: Rob Wang

Distracting background

50mm f/8

Model: Rob Wang

Shallower depth of field

50mm f/1.8

Model: Rob Wang

Shallower depth of field

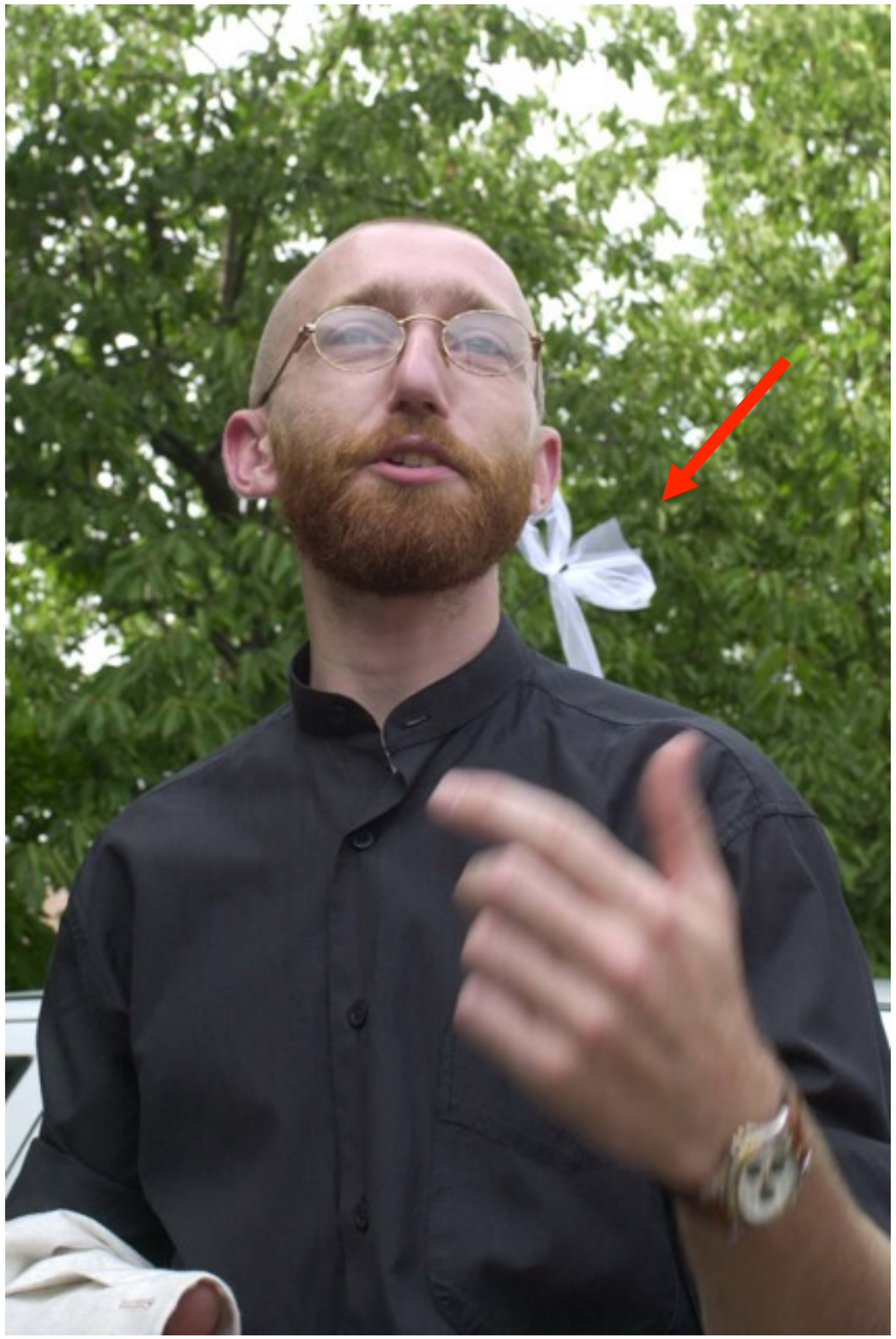
85mm f/1.2

Model: Rob Wang

Isolate using blur (Photoshop, layering)

- **But maybe don't over-do it**

Clone brush/Poisson cleaning



Desaturate, darken

From Digital Photographer's Handbook

Compositing & matting

© Laurie Thompson, Imagination Studios

figure 7.17

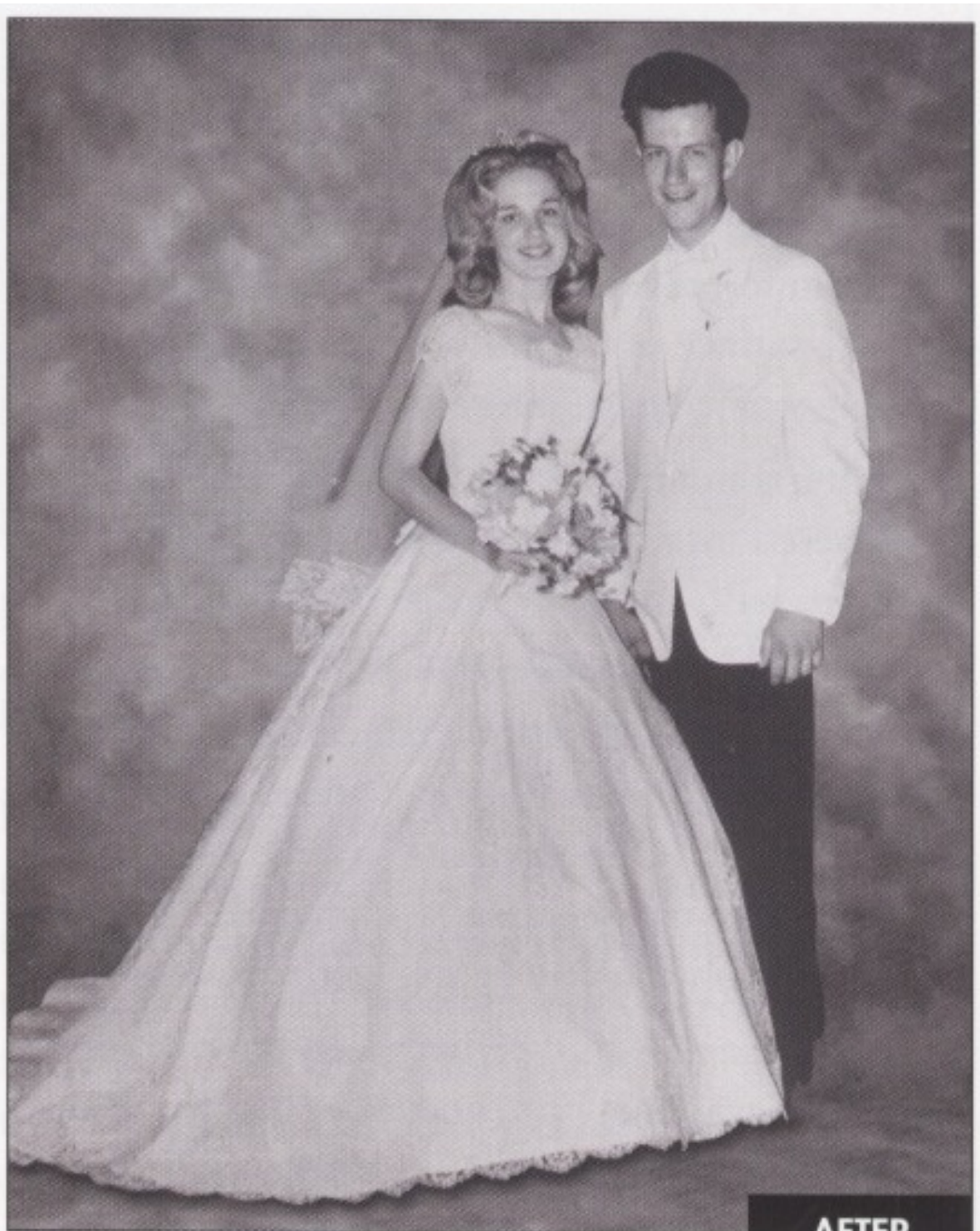


figure 7.18

Simplify: Get close

- **Our eyes tend to "zoom" and forget how small the subject is**
- **or crop (but then you lose resolution)**

Get close to your subject

(On the other hand, this is not the best picture ever)

http://www.fotofinish.com/resources/centers/photo/takingpictures.htm

If you can't make it good, make it tight

Question?

- **Recap: avoid distracting background**
- **Simplify, get close**

Composition

Get low

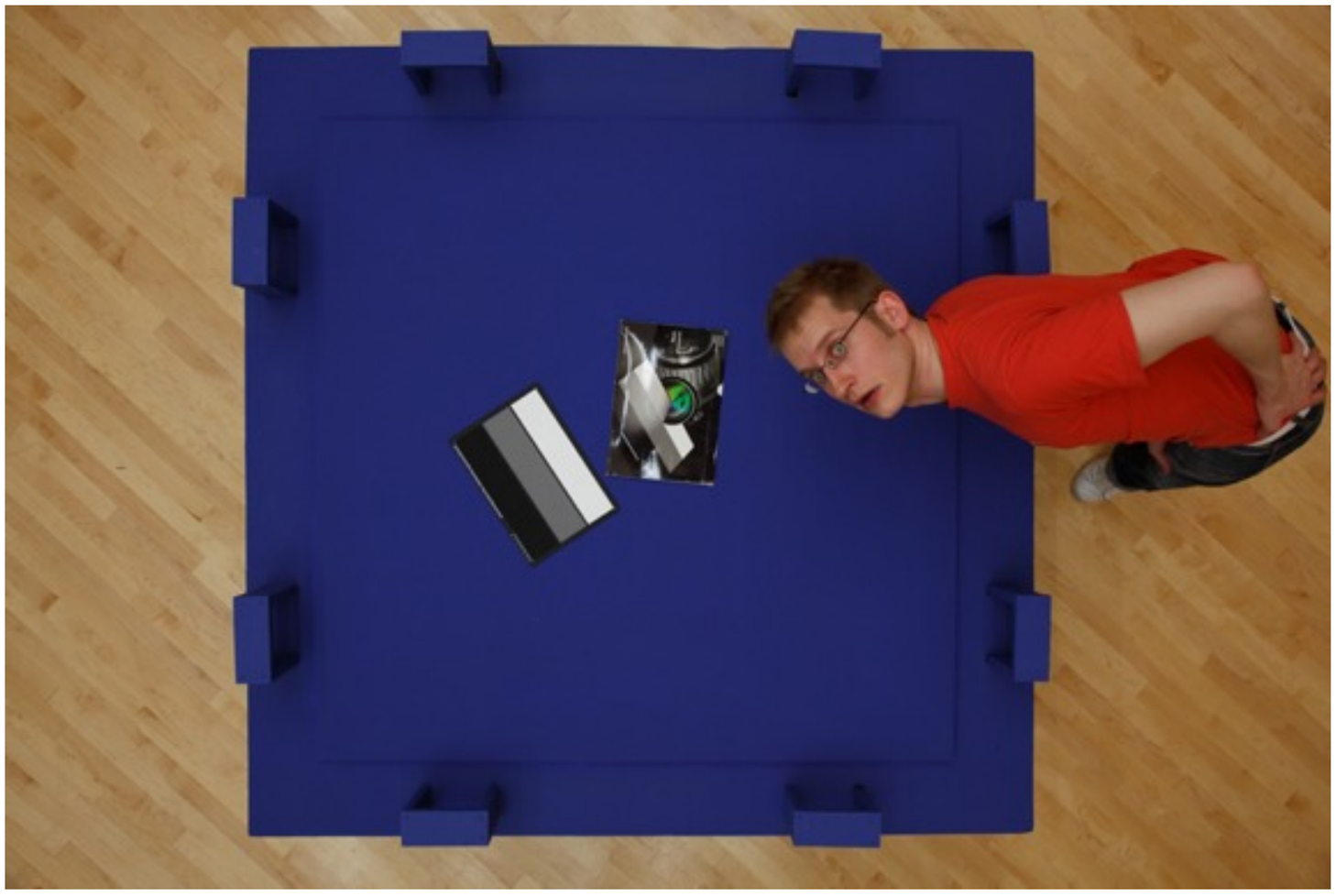
- **Try to be at eye level**

Bad

Better

Or really get high

- **As usual, follow a rule or really break it.**



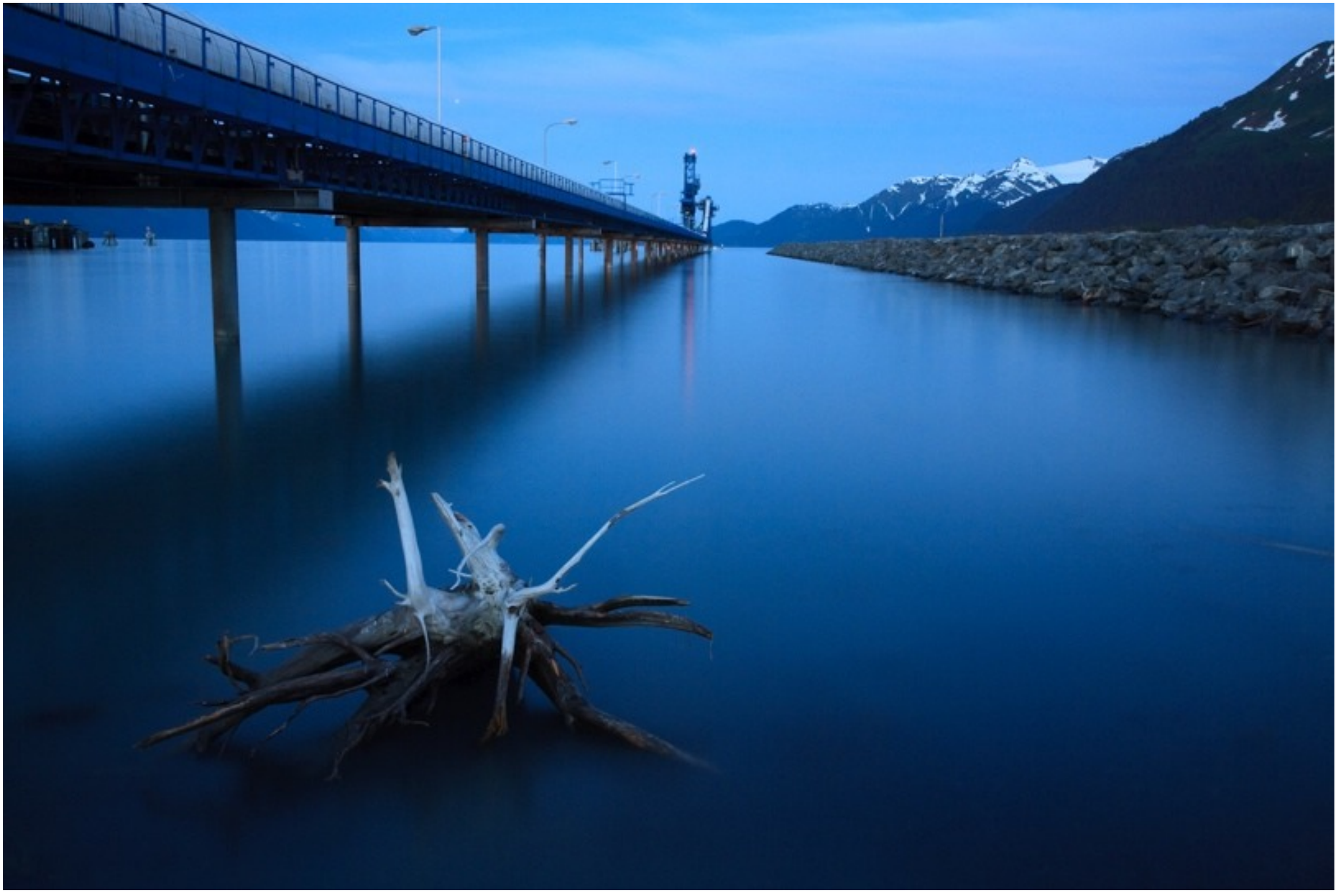
Rule of the thirds

Susie Post

The rule of thirds is a guideline developed by artists centuries ago. When the subject—or its most important element—is placed near one of the intersecting points of an imaginary grid, the viewer's eye is led through the frame. The result is an aesthetically strong image.

National Geographic Photography field guide

Rule of the thirds



Variations of the rule of the thirds

- **Golden ratio**
  - Very questionable superstition
  - http://plus.maths.org/issue22/features/golden/
- **Rule of the fifth**
- **...**

- **Only one thing matters: don't center!**

Don’t center, especially for motion

Don’t center, especially for motion

Don’t center, especially for motion

... or do center

Question

- **Recap:**
  - avoid distracting background
  - simplify, get close
  - avoid centering subject

Build on diagonal lines

Warning: near-parallelism

- **In particular, keep horizon level**
- **Use crop with rotation to fix this**

Don't let lines unintentionally throw your photo off balance. When you shoot the horizon or a building, keep the straight lines level—unless you're shooting at a dramatic, intentional angle.

Keep the horizon level

http://www.fotofinish.com/resources/centers/photo/takingpictures.htm

- **or use bubble level on flash hot shoe**

Correct perspective (perspective crop)

CSAIL

+ you control reflection and perspective independently

Try unusual angles

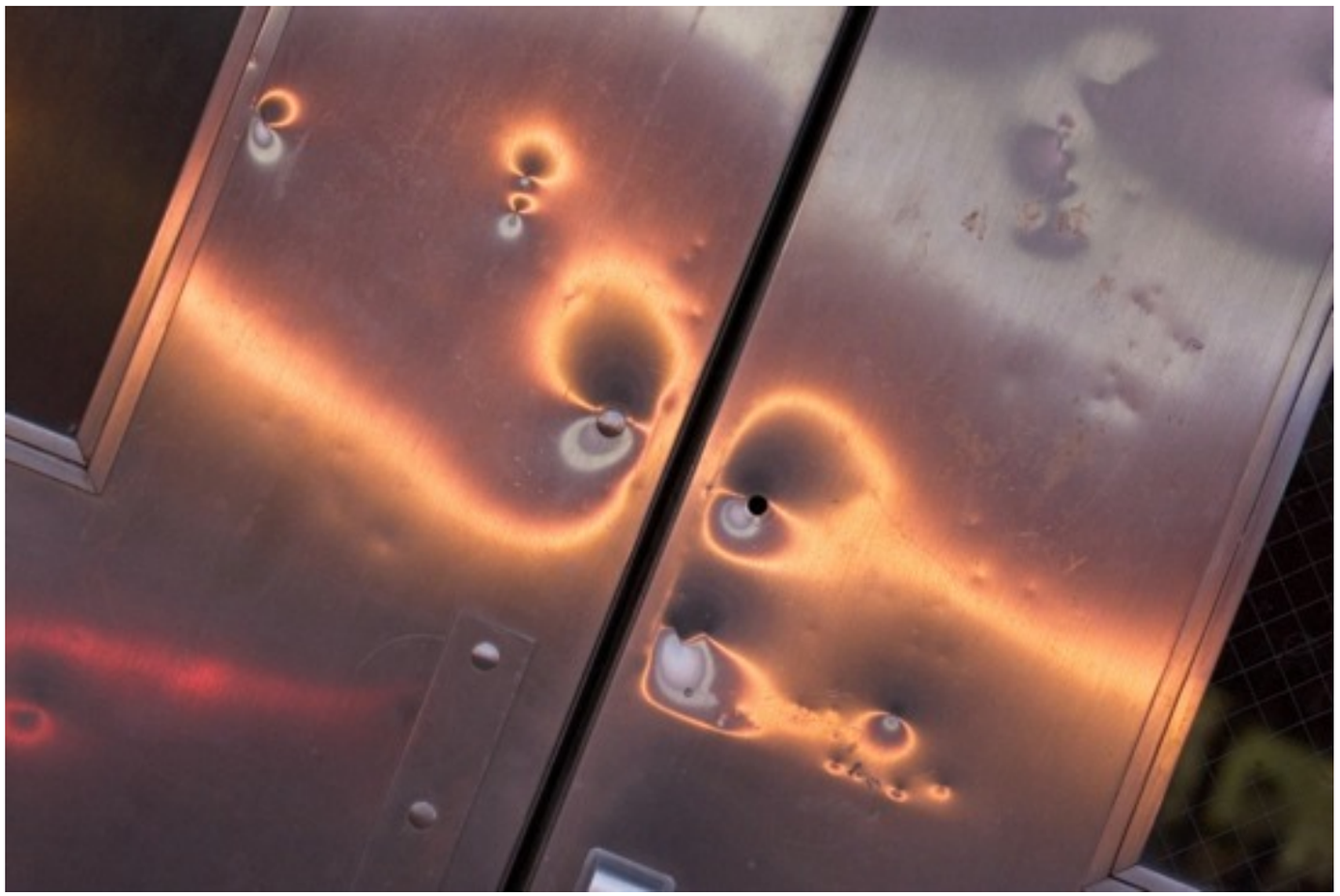
- **Do or don't:**
  Either perfectly vertical or at least 30 degrees

Try Unusual Angles
Be bold! Try turning your camera to 45 degrees before snapping a picture. Or instead of snapping it from eye level, kneel down or lie on the ground to get a more interesting shot.

Take a picture from an unusual angle

http://www.fotofinish.com/resources/centers/photo/takingpictures.htm

Do or don’t



Question

- **Recap:**
  - avoid distracting background
  - simplify, get close

  - avoid centering subject
  - get low
  - careful with alignment

Light

Light

- **Avoid harsh light…**
  unless you want to play with shadows
  - –Do or don't

Bottom line

- **Don't get married on a sunny day!**

Go in the shade

- **Light is more diffuse**

Bad

Better

Overcast days are the best

- **Just don’t put the sky in the frame**

The weather conditions

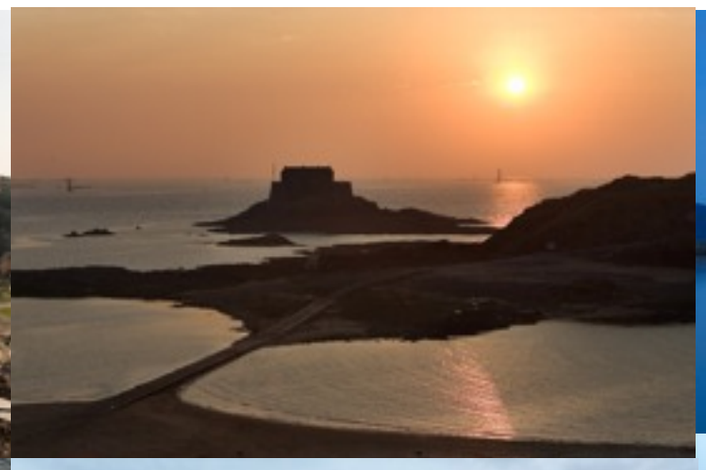
The pictures

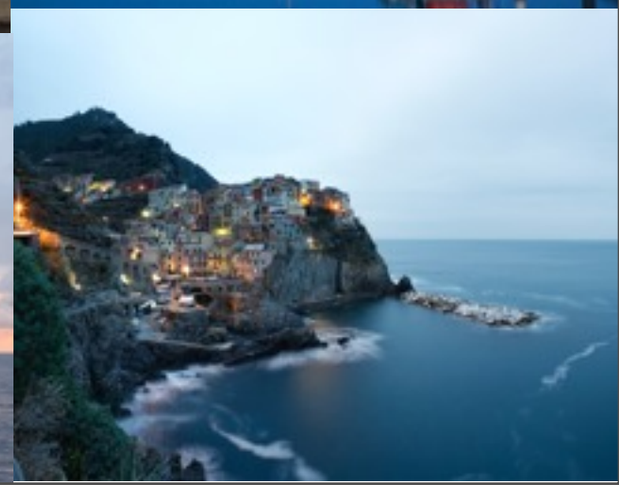
Other overcast-day pictures

Best time of day: sunset & sunrise

- **+/- 1 hour**
- **“Golden hours”**
- **Night photography: always near sunset/sunrise**
  - –because of nice diffuse light

Mid day	less than 1 hour after sunrise/ before sunset	During sunset or sunrise	After sunset

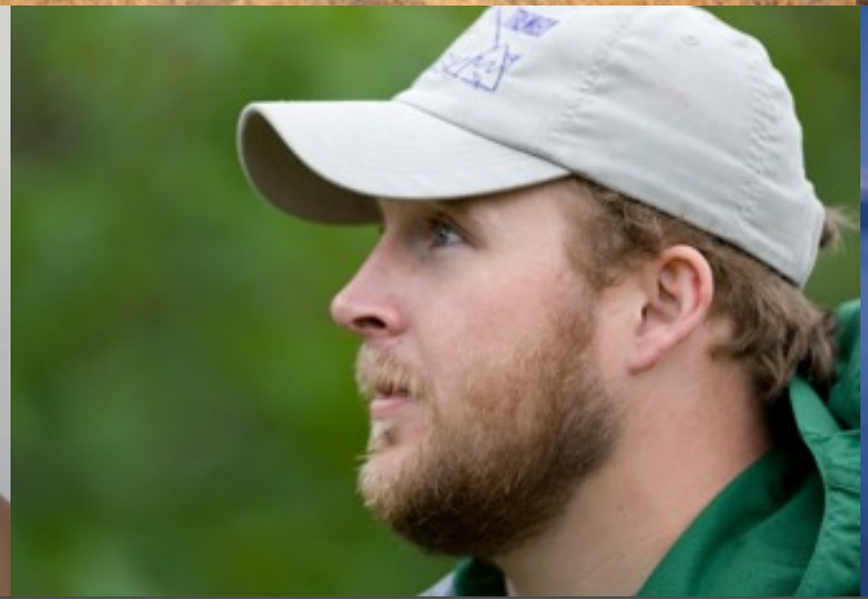




less than 1 hour after sunrise

During sunset/sunrise

After sunset



Thursday, October 29, 2009

- **10 minutes after sunset**

Add fill-in

- **but set to -2EV (flash compensation, darker by a factor of 4)**

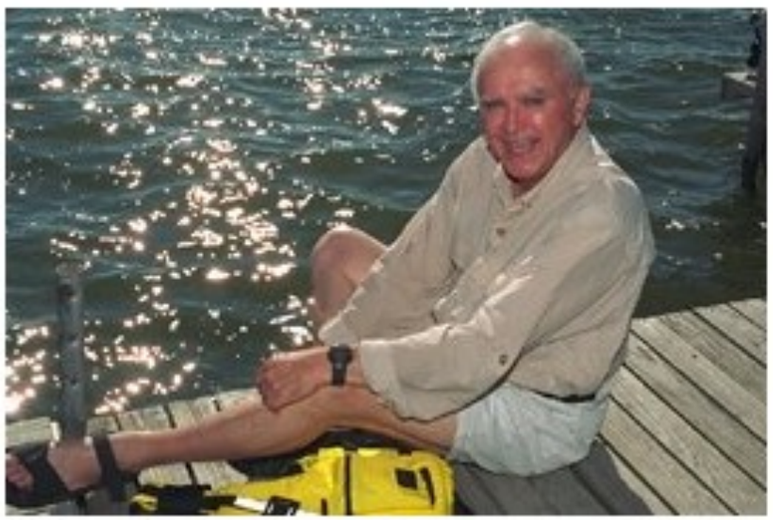
3 Use flash outdoors

Bright sun can create unattractive deep facial shadows. Eliminate the shadows by using your flash to lighten the face. When taking people pictures on sunny days, turn your flash on. You may have a choice of fill-flash mode or full-flash mode. If the person is within five feet, use the fill-flash mode; beyond five feet, the full-power mode may be required. With a digital camera, use the picture display panel to review the results.

On cloudy days, use the camera's fill-flash mode if it has one. The flash will brighten up people's faces and make them stand out. Also take a picture without the flash, because the soft light of overcast days sometimes gives quite pleasing results by itself.

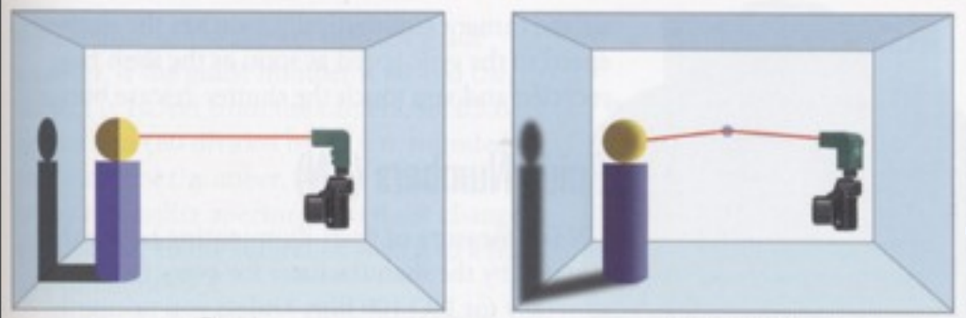
▪ **Learn more about composing people pictures**

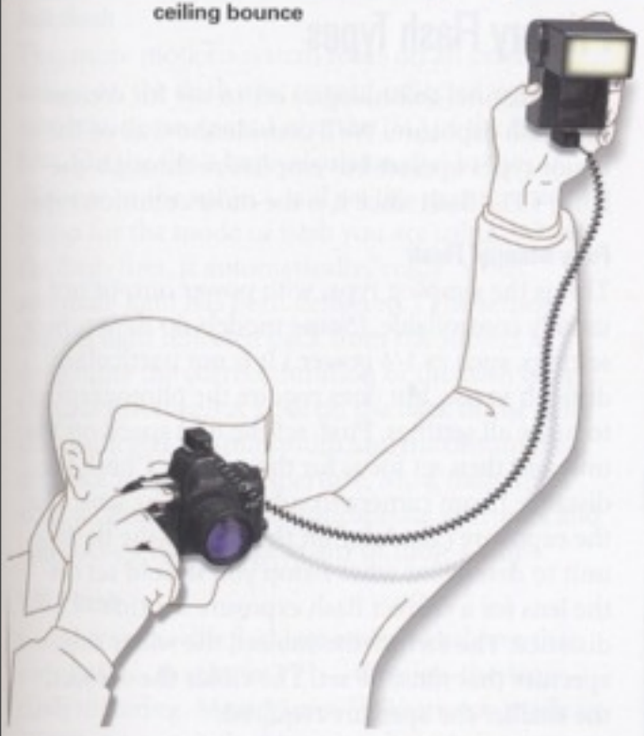
Subject is dark



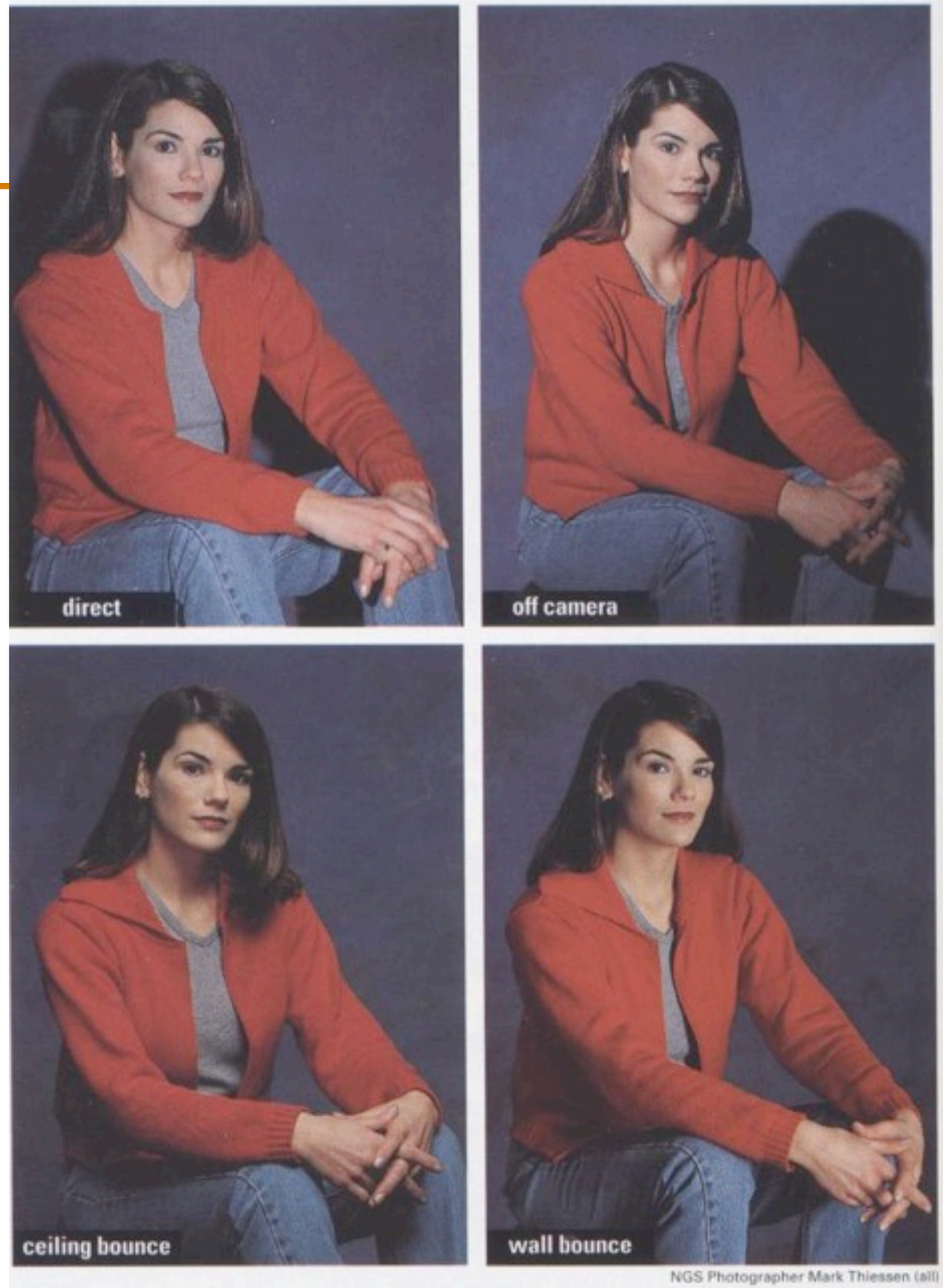
After

http://www.kodak.com/eknec/PageQuerier.jhtml?pq-path=317&pq-locale=en_US





Illustrated here are the lighting effects produced by **direct, wall bounce, ceiling bounce, and off-camera direct flash.** The location and quality of the subject's shadow changes, depending on the flash technique used. Direct flash, although sometimes necessary, produces a harsh image. Bounce flash produces softer light and softer shadows. Wall-bounce flash is similar to ceiling bounce flash with the added benefit of better revealing the subject's shape.



NGS Photographer Mark Thiessen (all)

Direct, on-camera flash is harsh and unflattering. Removing the flash from the camera, or bouncing the flash light from a nearby surface produces different effects. Light bounced from a ceiling, although commonly used, causes dark shadows in the eye sockets and under the nose and chin. The most successful technique indoors is to bounce light from a nearby light-colored wall.

National Geographic Photography field guide

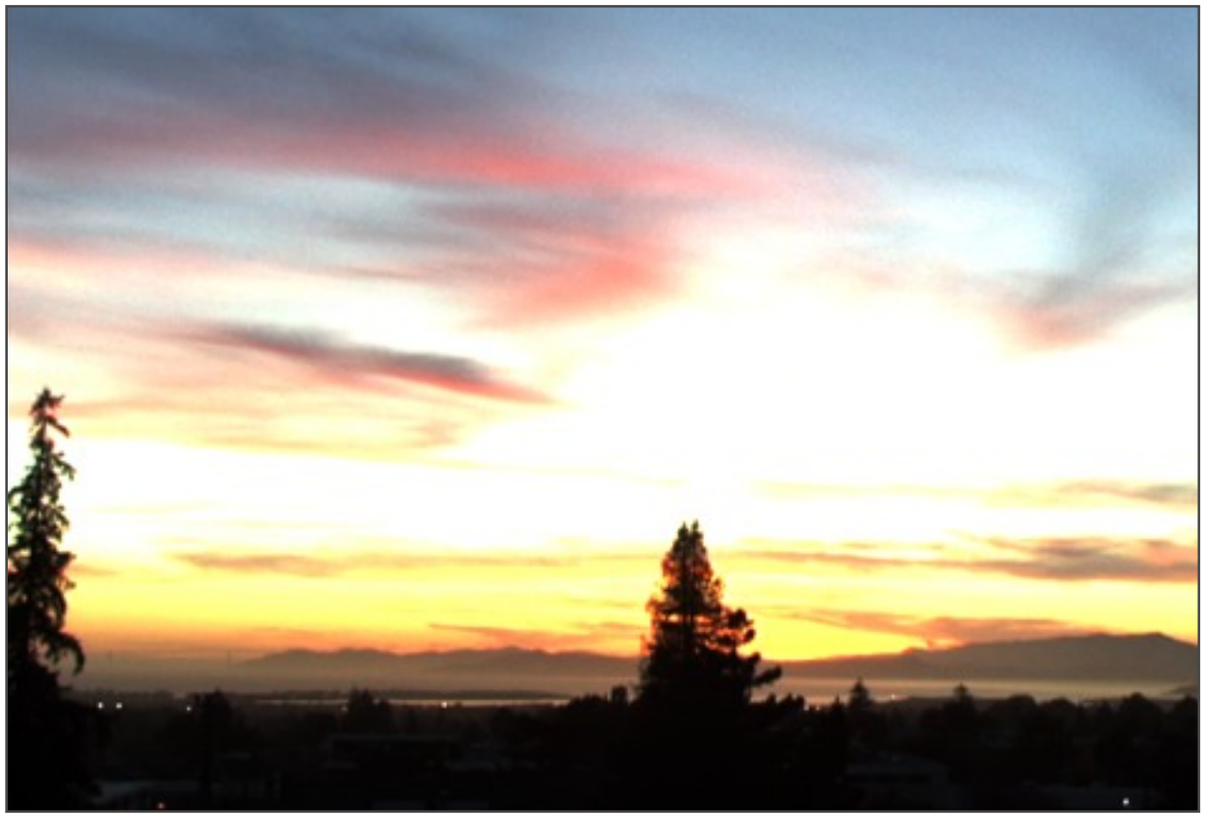
Add fill in light on faces: Photoshop

Add fill in light on faces

Options for digital fill light

- **Use the fill-in slider in Lightroom or camera raw**
- **Use an adjustment layer with a mask**
  - paint the mask white only in the area to brighten.

Landscape: HDR & Tone mapping



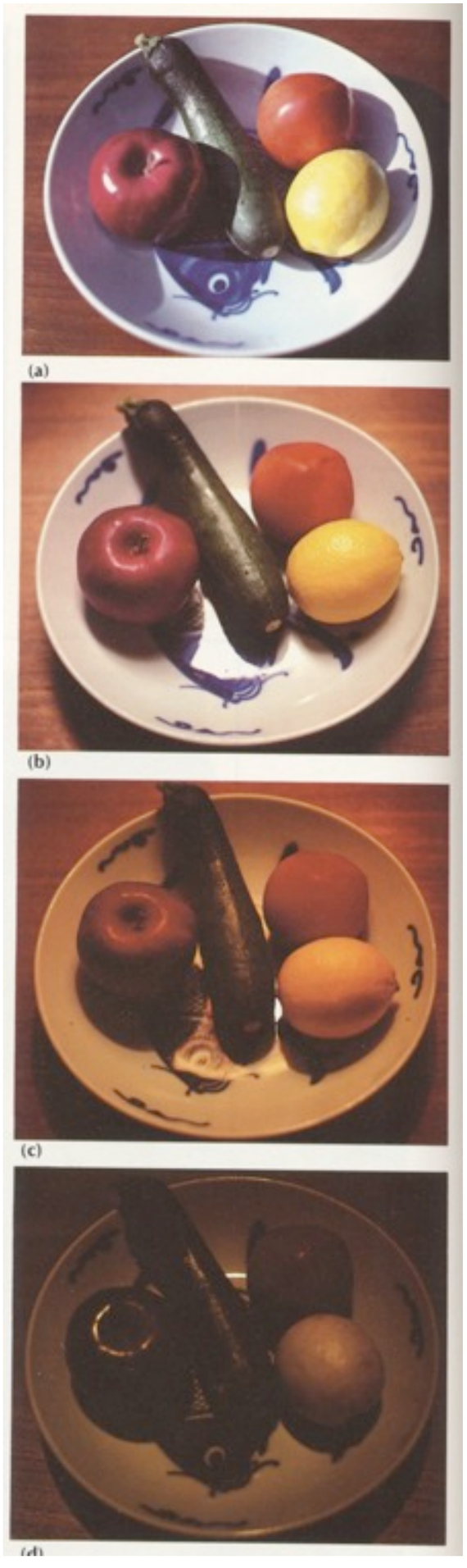
Light & color

- **Avoid harsh light…**
  unless you want to play with shadows
  - –Do or don't
- **Sunrise & sunset are best**
- **Cloudy days are great as long as the sky is not in the picture**
- **For sunny days, shade areas are best**
- **Avoid direct flash**
- **HDR, tone map**

White balance

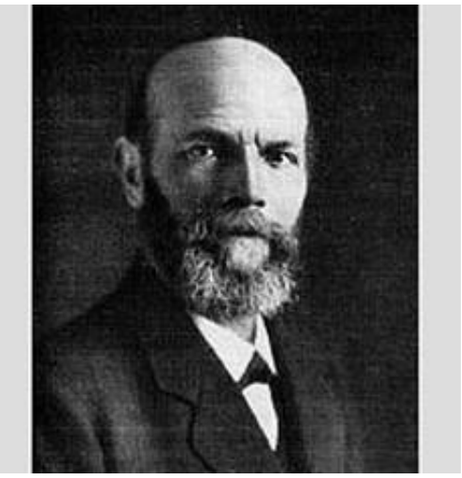
White balance problem

- When watching a picture on screen or print, we adapt to the illuminant of the room, not that of the scene in the picture
- The eye cares more about objects' intrinsic color, not the color of the light leaving the objects
- We need to discount the color of the light source



Same object, different illuminants

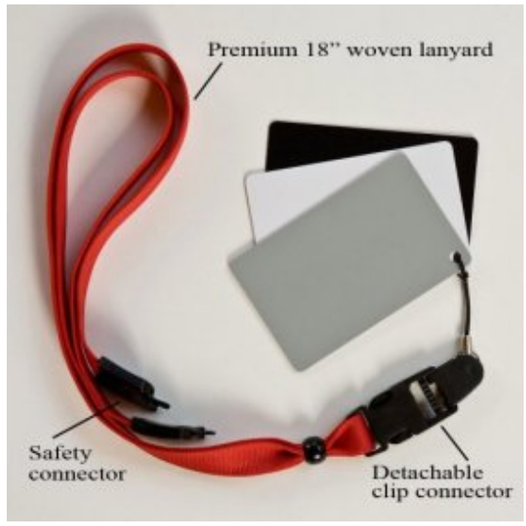
Von Kries adaptation



- Multiply each channel by a gain factor
- Note that the light source could have a more complex effect
  - Arbitrary 3x3 matrix
  - More complex spectrum transformation

http://www.cambridgeincolour.com/tutorials/white-balance.htm

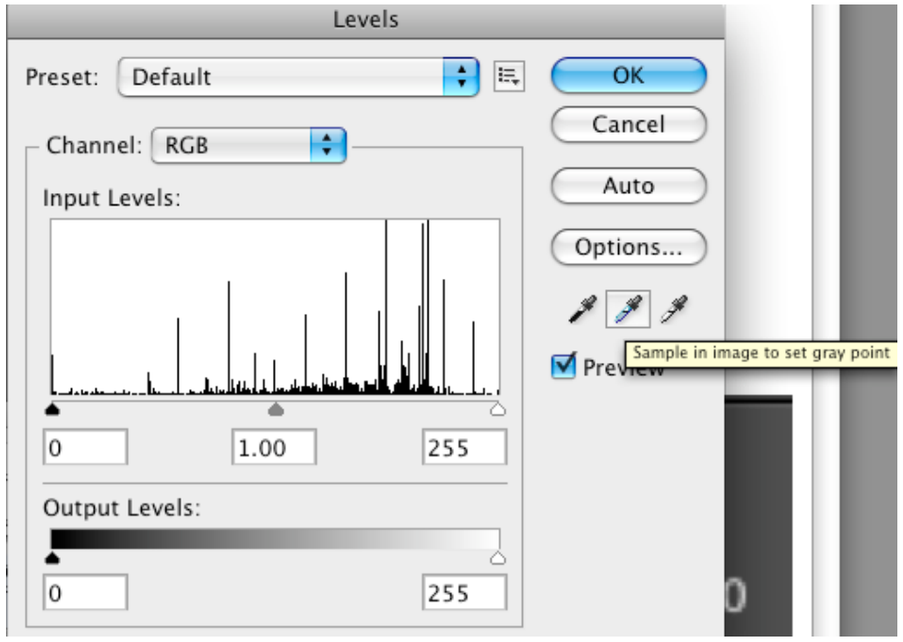
Best way to do white balance

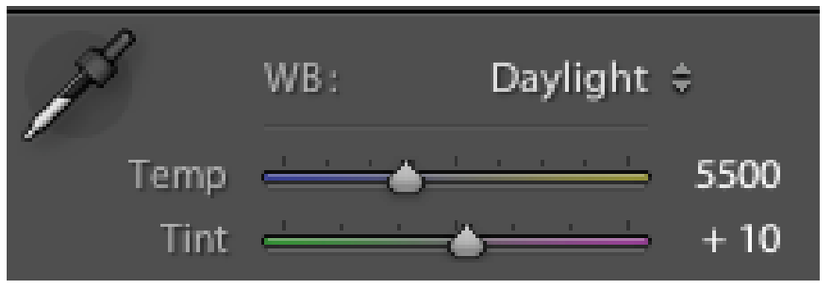


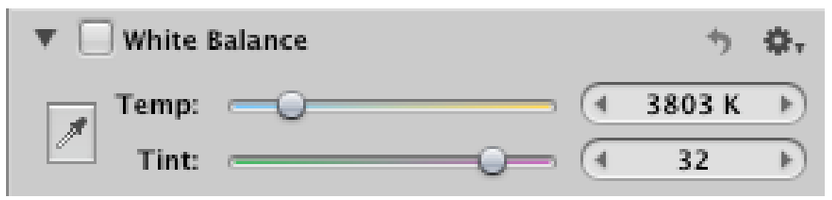
- Grey card:
- Take a picture of a neutral object (white or gray)
- Deduce the weight of each channel
- If the object is recoded as r_w, g_w, b_w use weights k/r_w, k/g_w, k/b_w where k controls the exposure

Lightroom demo

- Most photo editing software lets you click on a neutral object to achieve white balance
- In “Levels” in Photoshop
- In “basic” in Lightroom
- In Adjustments in Aperture
- You also often have presets such as daylight, tungsten







Party name tags

- Provide excellent white references!

Challenge: mixed lighting

- **In particular, flash+ambient**
- **Solution: put yellowish gel on the flash**
- **Solution 2: http://people.csail.mit.edu/ehsu/work/sig08lme/**

Recap

- **Follow rules or really break them**
- **Simplify, avoid cluttered background**
  - move your viewpoint, frame tighter, shallow depth of field, desaturate
- **Don't center things**
  - rule of the third, leave space for gaze or motion
- **Avoid harsh light**
  - golden hours, overcast days, avoid direct sunlight, go in the shade, fill flash, bounce flash, post-processing
- **White balance**

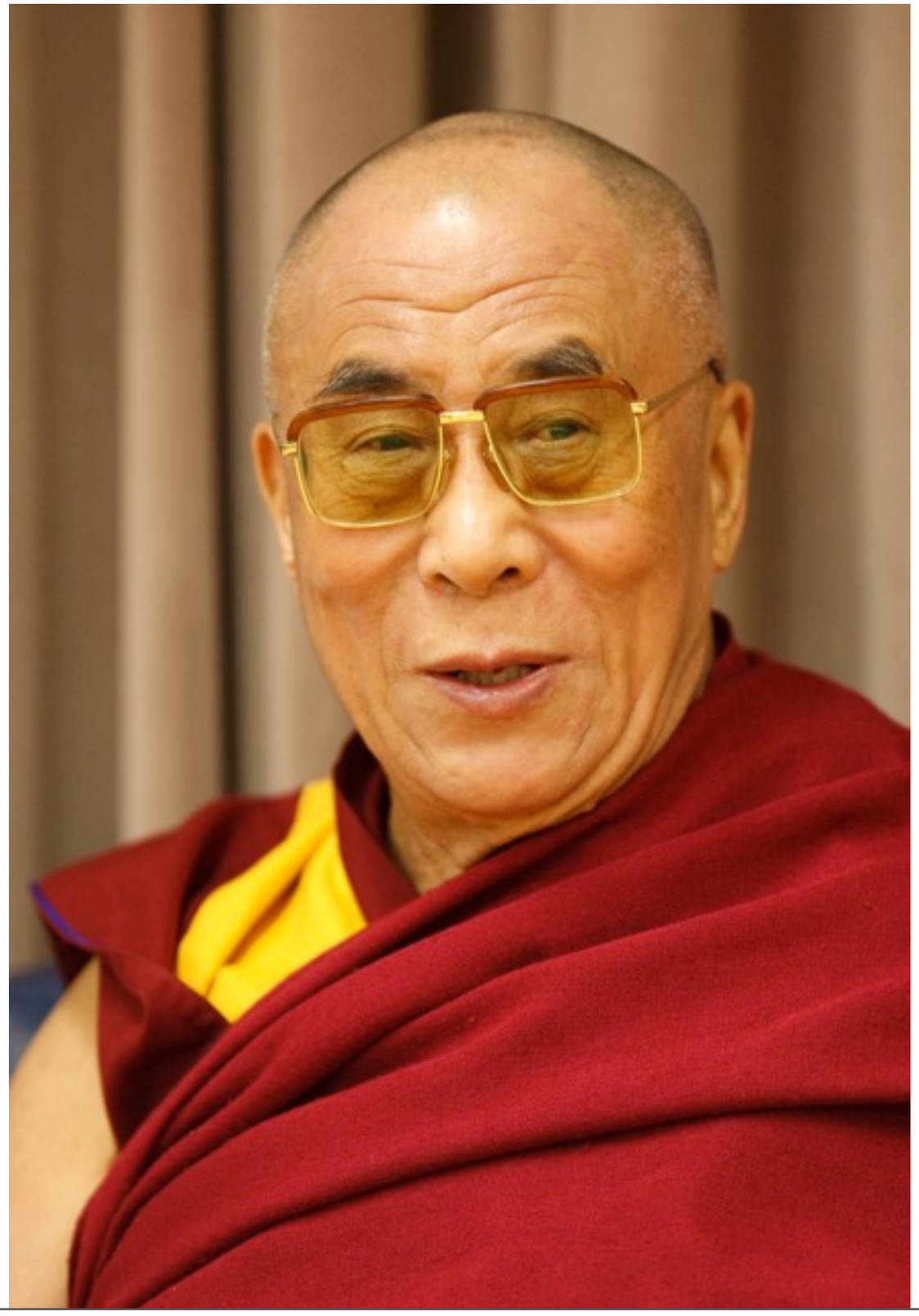
Portraits

Portraits: It's all about the eyes

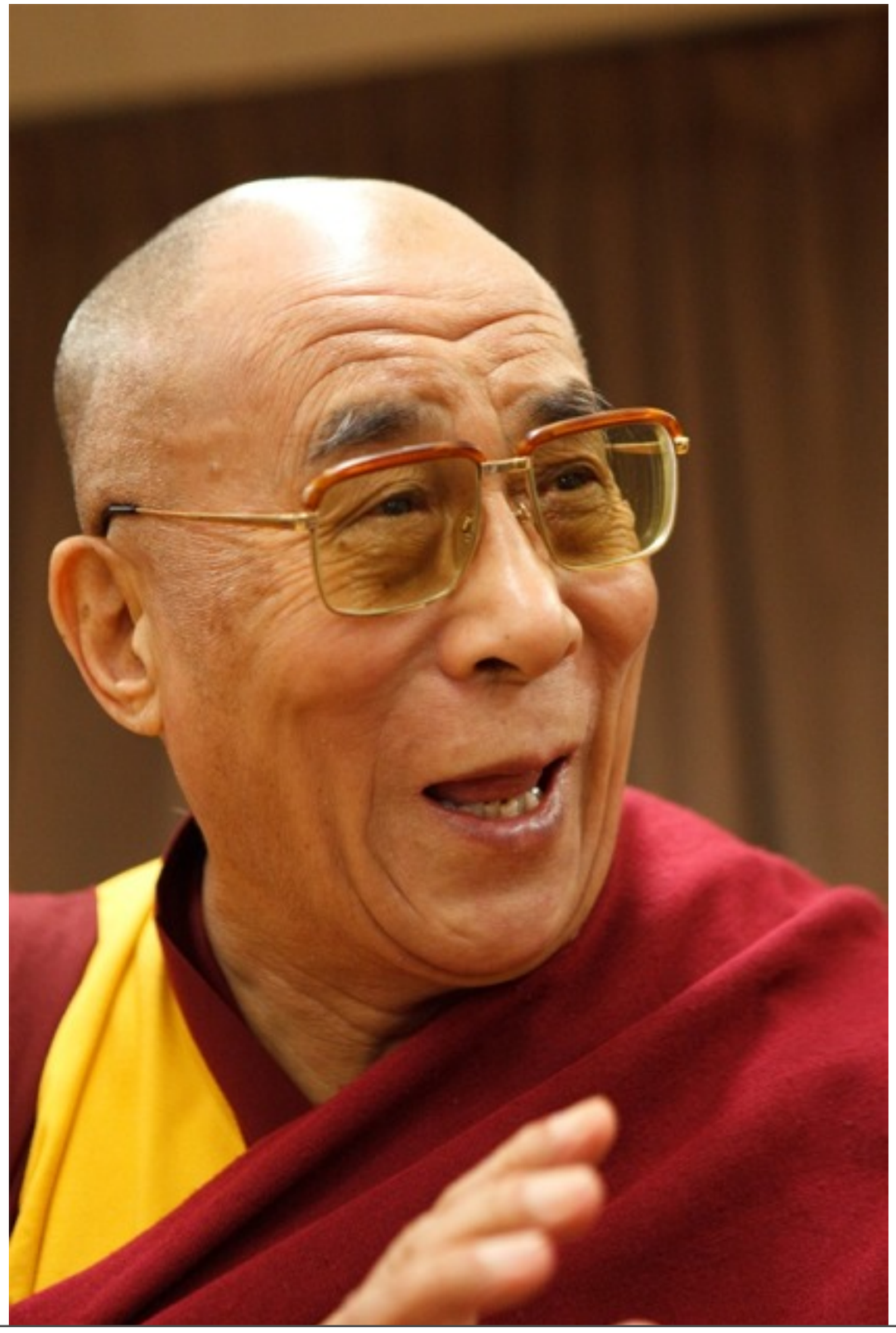
- **Eyes should be sharp & shiny**
- **Be at eye level... or try unusual viewpoints**
- **Make sure lighting is not harsh**
- **Shallow depth of field can help**
- **Add vignetting to focus attention**
- **Get the white balance right (but maybe a little warm)**
- **Try to convert to Black and white**
- **Telephoto to isolate the subject (more formal)**
- **Wide angle to make him/her approachable and include surrounding**
- **Don't hesitate to over-shoot: bits are cheap**

Telephoto vs. wide angle

300mm f/2.8



24-70



Tougher than portraits: 2 people

- **Focus is harder: both sets of eyes should be sharp**
  - –tradeoff between complex background
- **Hard to get both expressions right**
- **=> shoot like crazy**
- **=> use photomontage**

Not great (mother's eyes are out of focus)

Better

Interactive Digital Photomontage

- **Aseem Agarwala et al.**
  http://grail.cs.washington.edu/projects/photomontage/
- **Merge multiple images**
- **User puts strokes to select which image where**
- **Graph cut + Poisson reconstruction**

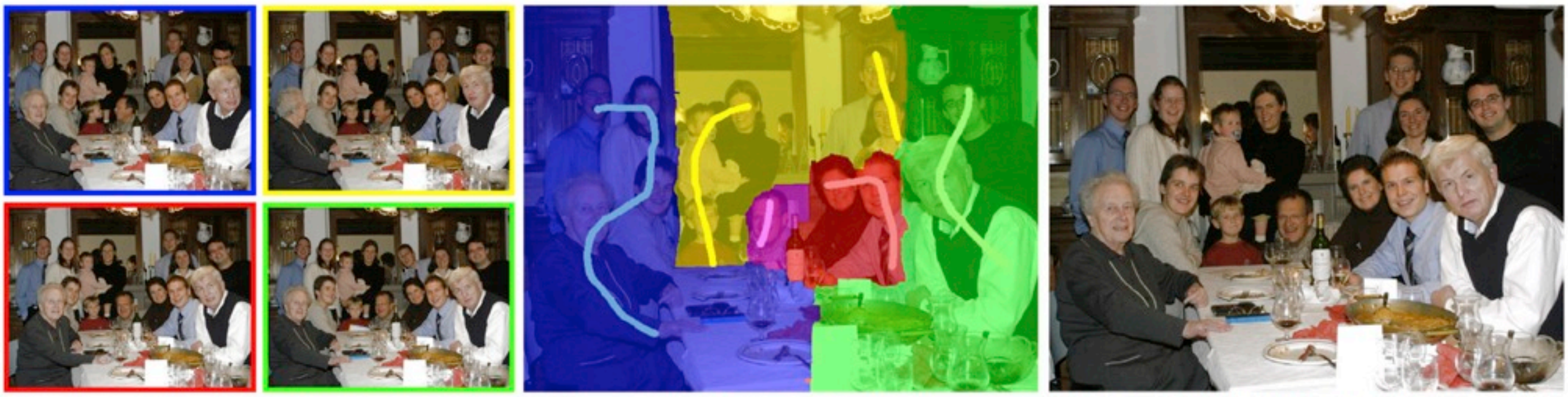


Figure 1 From a set of five source images (of which four are shown on the left), we quickly create a composite family portrait in which everyone is smiling and looking at the camera (right). We simply flip through the stack and coarsely draw strokes using the *designated source* image objective over the people we wish to add to the composite. The user-applied strokes and computed regions are color-coded by the borders of the source images on the left (middle).

Portraits: dirty tricks

- **Pascal Dangin http://www.newyorker.com/reporting/2008/05/12/080512fa_fact_collins**
- **My favorite quote: "There is no photographic establishment of any note that does not employ artists at high salaries—we understand not less than £1 a day—in touching, and colouring, and finishing from nature those portraits for which the camera may be said to have laid the foundation," Lady Elizabeth Eastlake, the art historian and critic, noted in an essay in 1857.**
- **http://www.theage.com.au/articles/2003/03/03/1046540121180.html**
- **http://www.time.com/time/fashion/20030908/insider/6.html**

Trick #1: diffuser

- **Other option: soft focus lens (with increased spherical aberrations)**

- **Digital version: blur or surface blur**

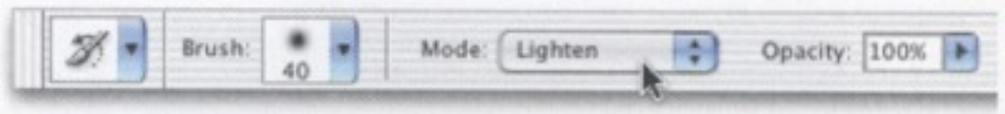
From Corrective Lighting and Posing

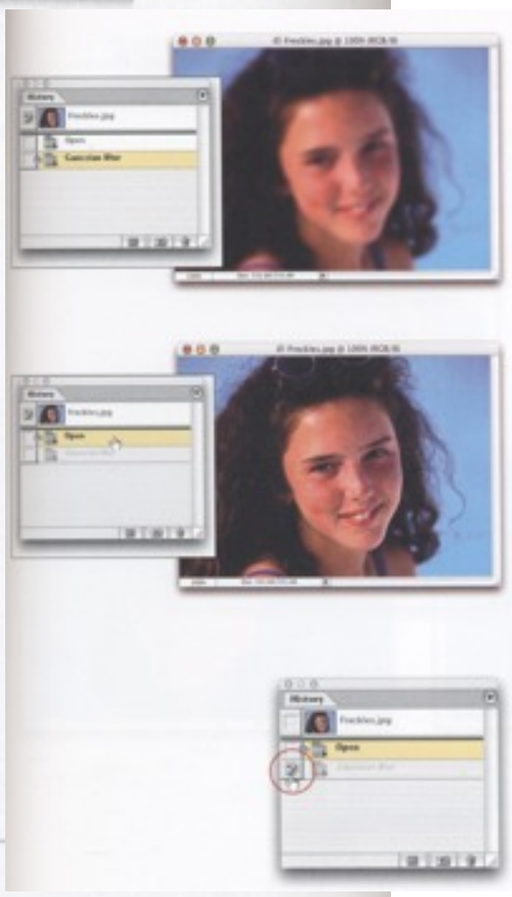
Diffusion

I hate to say "always," but 98% of the time we diffuse each portrait that is taken. Since we are working with subjects who are at an age when skin clarity can be a problem, we recognize that their complexion can't handle the clarity of today's lenses. We use the Glamour Softs by Sailwind (#1). It softens the portrait without losing the critical sharpness in the eyes. I like to use a drop-in filter for easy focusing, especially as I get older.

Step Six:

To keep from simply painting in a blurry version of our photo, go up to the Options bar and change the History Brush's Blend Mode to Lighten. Now when you paint, it affects only the pixels that are darker than the blurred state. Ahhh, do you see where this is going? Now, you can take the History Brush and paint over the acne areas, and as you paint, you'll see them diminish quite a bit (as shown below). If they diminish too much, and the person looks "too clean," press Command-Z (PC: Control-Z) to undo your History Brush strokes, then go up to the Options bar and lower the Opacity of the brush to 50% and try again.

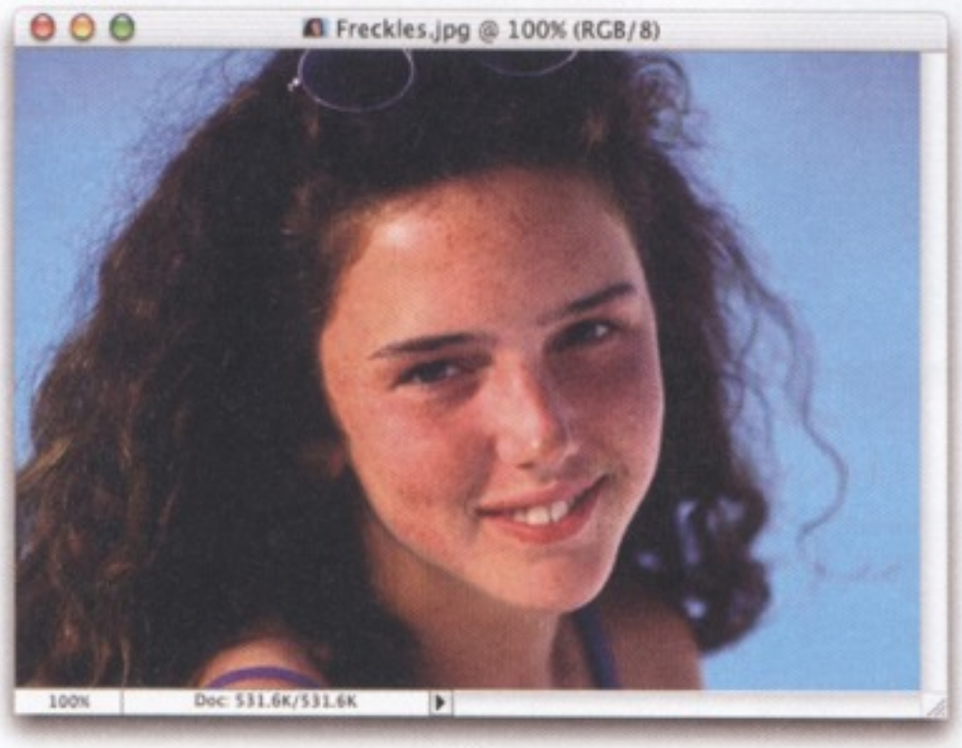




Step Three:
Go under the Window menu and choose History to bring up the History palette. This palette keeps track of the last 20 things you've done in Photoshop. If you look in the list of steps (called "History States"), you should see two States: The first will read "Open" (this is when you opened the document), and the second will read "Gaussian Blur" (this is where you added the blur).

Step Four:
Click on the Open State to return your photo to what it looked like when you originally opened it (as shown here). The History palette also works in conjunction with a tool in the Toolbox called the History Brush. When you paint with it, by default, it paints back to what the photo looked like when you opened it. It's like "Undo on a brush." That can be very handy, but the real power of the History Brush is that you can have it paint from a different state. You'll see what I mean in the next step.

Step Five:
In the History palette, click in the first column next to the State named "Gaussian Blur." If you painted with the History Brush now, it would paint in what the photo looked like after you blurred it (which would do us no good), but we're about to fix that.



Before.

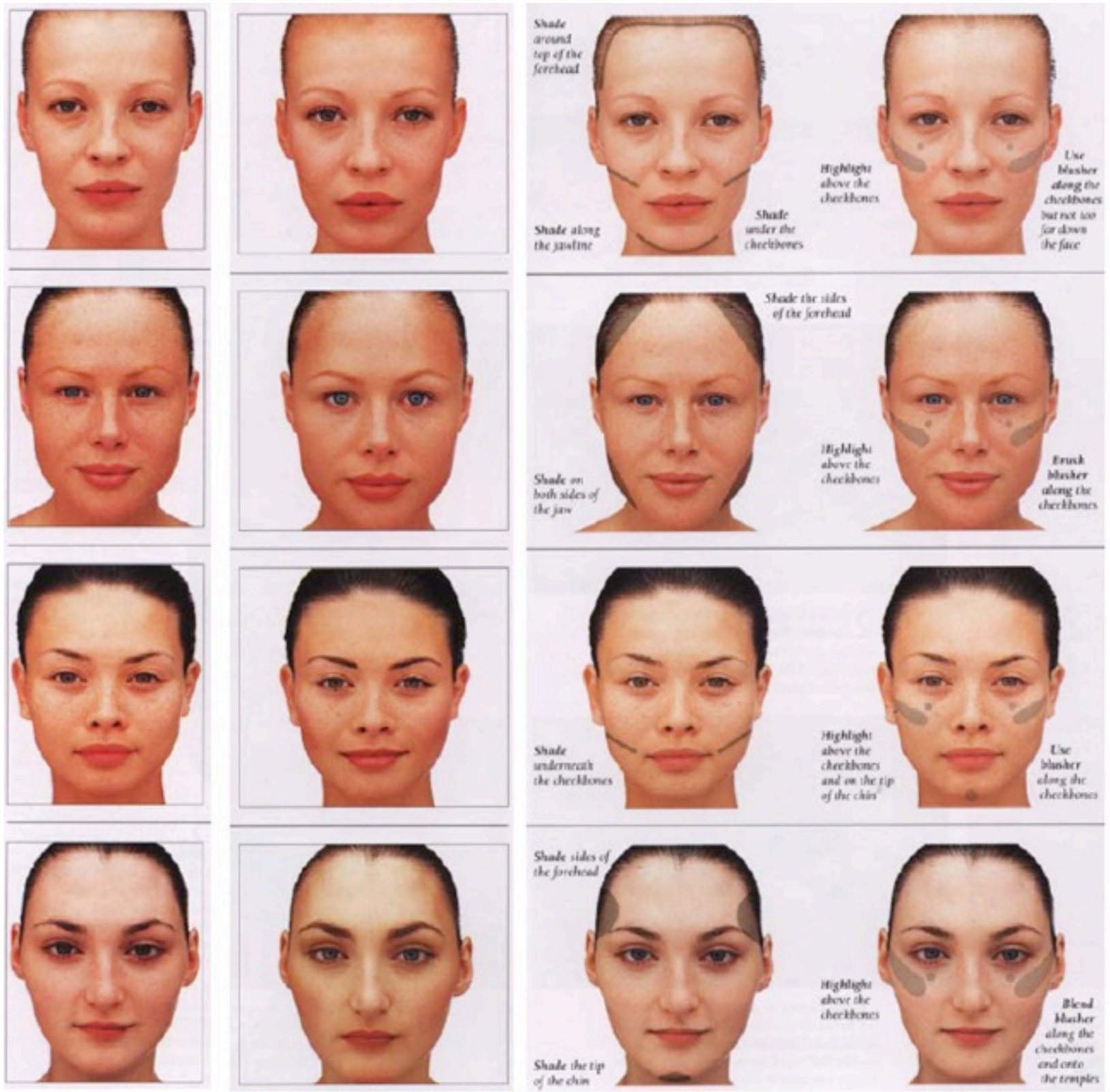
After.

Shading and highlighting

Snapshot-Perspective-Speed, aperture-Filter-Lighting-Processing & Print-**Make up**-Retouching

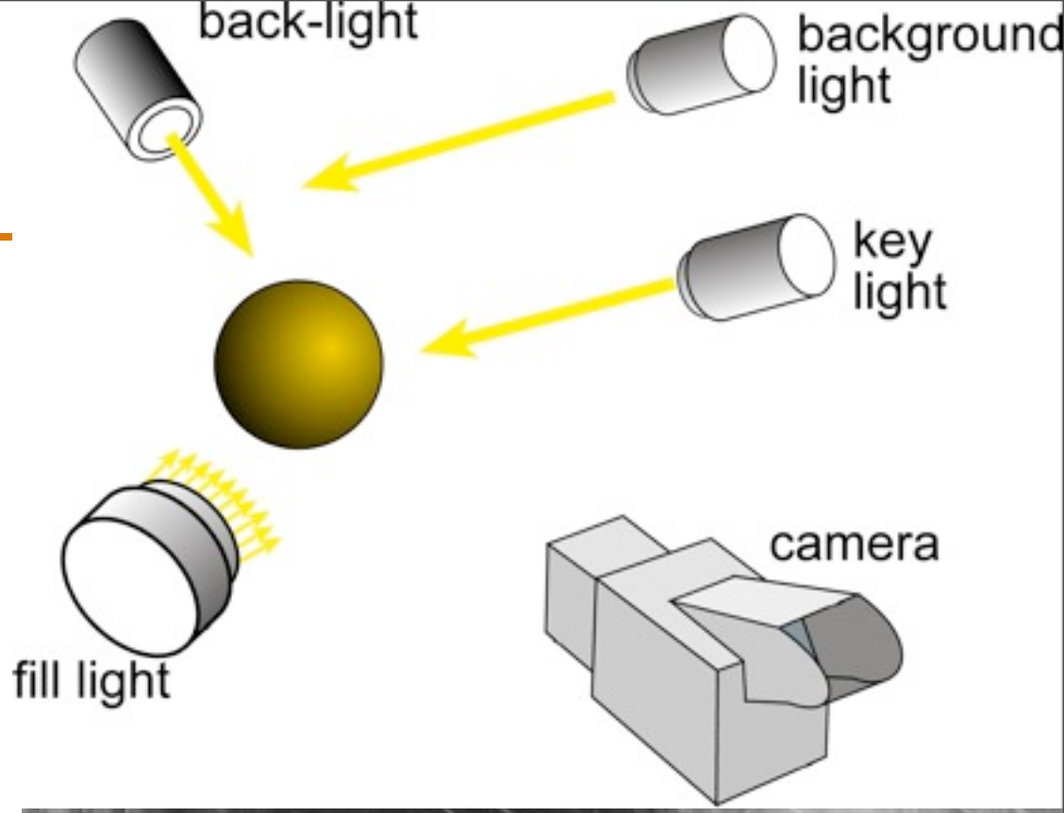
Corrective Make Up

- **Depending on the shape of the face**



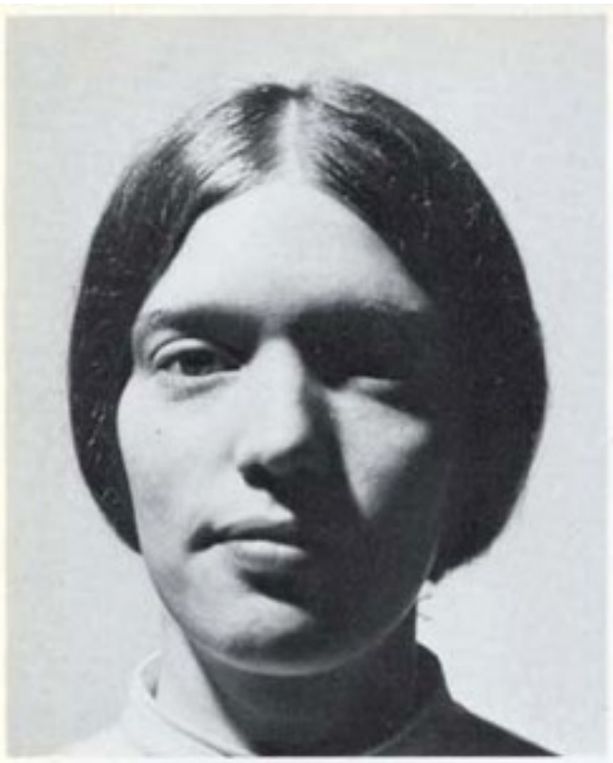
Lighting

- **E.g. 3-point lighting**
  - Reduce dynamic range
  - Emphasize silhouettes
    =>3D cues



- **Goals of lighting:**
  - Manage dynamic range
  - Reveal shape, layout, material
  - Tell story

Portrait lighting



Main light

Fill-in light

Accent light

Background light

Lightin toys

glossary of lighting terms

Lighting, like any other craft, has its own jargon and slang. Unfortunately, the different terms are not very well standardized. Often the same object may be described in two or more ways or the same word used to mean two or more different things. For example, a sheet of black card, wood, metal or other material that is used to control reflections or shadows may be called a flag, a French flag, a donkey or a gobo – though some people would reserve the term "gobo" for a flag with holes in it, which is also known as a cookie. In this book, we have tried to standardize terms as far as possible. For clarity, a glossary is given below, and the preferred terms used in this book are asterisked (*).

Acetate
see Gel

Acrylic sheeting
Hard, shiny plastic sheeting, usually methyl methacrylate, used as a diffuser ("opal") or in a range of colours as a background.

***Barn doors**
Adjustable flaps affixed to a lighting head that allow the light to be shaded from a particular part of the subject.

Barn doors

Boom
Extension arm allowing a light to be cantilevered out over a subject.

***Bounce**
A passive reflector, typically white but also, (for example) silver or gold, from which light is bounced back onto the subject. Also used in the compound term "Black Bounce", meaning a flag used to absorb light rather than to cast a shadow.

Continuous lighting
What its name suggests: light that shines continuously instead of being a brief flash.

Contrast
see Lighting ratio

Cookie
see Gobo

***Diffuser**
Translucent material used to diffuse light. Includes tracing paper, scrim, umbrellas and translucent plastics such as Perspex and Plexiglas.

Electronic flash: standard head with diffuser (Strobex)

Donkey
see Gobo

Effects light
Neither key nor fill; a small light, usually a spot, used to light a particular part of the subject. A hair light on a model is an example of an effects (or "FX") light.

***Fill**
Extra lights, either from a separate head or from a reflector, which "fills" the shadows and lowers the lighting ratio.

Fish fryer
A small Soft Box.

***Flag**
A rigid sheet of metal, board, foam-core or other material used to absorb light or to create a shadow. Many are painted black on one side and white (or brushed silver) on the other, so they can be used either as flags or as reflectors.

***Flat**
A large Bounce, often made of a thick sheet of expanded polystyrene or foam-core (for lightness).

Foil
see Gel

French flag
see Flag

Frost
see Diffuser

***Gel**
Transparent or (more rarely) translucent coloured material used to modify the colour of a light. It is an abbreviation of "gelatine (filter)", though most modern "gels" are acetate.

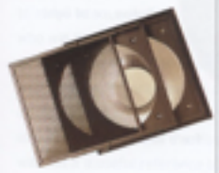
***Gobo**
As used in this book, synonymous with "cookie": a flag with cut-outs in it, to cast interestingly-shaped shadows. Also used in projection spots.

"Cookies" or "gobos" for projection spotlight (Photon Beard)

***Head**
A light source, whether continuous or flash. A "standard head" comes fitted with a plain reflector.

Electronic Flash: light brush "hose" (Hensel)

***HMI**
Rapidly-pulsed and effectively continuous light source approximating to daylight and running at far cooler temperatures than tungsten lights. They are most commonly used in studios that use digital scanning backs.



Honeycomb (Hensel)

***Honeycomb**
Grid of open-ended hexagonal cells, so called because it closely resembles a honeycomb. This increases the directionality of light from any head.

Incandescent lighting
see Tungsten

Inky dinky
Small tungsten spot.

***Key or key light**
The dominant or principal light, the light which casts the shadows.

Kill Spill
A large flat that is used to block spill.

Electronic Flash: light brush "pencil"

***Light**

brush
Light source "piped" through fibre-optic lead. Can be used to add highlights, delete shadows and modify lighting, literally by "painting with light".

Lighting ratio
The ratio of the key to the fill, as measured with an incident light meter. A high lighting ratio (8:1 or above) is very contrasty, especially in colour, a low lighting ratio (4:1 or less) is flatter or softer. A 1:1 lighting ratio is completely even, all over the subject.

***Mirror**
Reflectors are rarely mirrors, because mirrors create "hot spots" while reflectors diffuse light. Mirrors (especially small shaving mirrors) are widely used, almost in the same way as effects lights.

Northlight
see Soft Box

Perspex
A brand name for acrylic sheeting.

Plexiglas
A brand name for acrylic sheeting.

***Projection spot**
Flash or tungsten head with projection optics for casting a clear image of a gobo or cookie. Used to create textured lighting.

Electronic Flash: projection spotlight (Strobes)

Tungsten Projection spotlight (Photon Beard)

***Snoot**
Conical restrictor, fitting over a lighting head. The light can

Tungsten spot with conical snoot (Photon Beard)

Electronic Flash: standard head with parallel snoot (Strobes)

Electronic flash: standard head with large reflector and diffuser (Strobes)

***Soft box**
Large, diffuse light source made by shining a light through one or two layers of diffuser. Soft boxes come in all kinds of shapes and sizes, from about 30x30cm to 120x180cm and larger. Some are rigid; others are made of fabric stiffened with poles resembling fibreglass fishing rods. Also known as a northlight or a windowlight, though these can also be created by shining standard heads through large diffusers.

***Spill**
Light that ends up other than on the subject at which it is pointed. Spill may be used to provide fill or light backgrounds. It may be controlled with flags, barn doors or gobos.

***Spot**
Directional light source. Normally refers to a light using a focusing system with reflectors or lenses or both, a "focusing spot". Also used as a reflector head rendered more directional with a honeycomb.

Electronic flash: strip light with removable barn doors (Strobex)

***Strip or strip light**
Lighting head, usually flash, that is longer than it is wide.

Strobe
Electronic flash. Strictly, a "strobe" is a stroboscope or rapidly repeating light source, though it is also the name of a leading manufacturer: Strobex.

Swimming pool
A very large Soft Box.

***Tungsten**
Incandescent lighting. Photographic tungsten lighting runs at 3200°K or 3400°K, as compared with domestic lamps which run at 2400°K to 2800°K.

Electronic flash: standard head with standard reflector (Strobex)

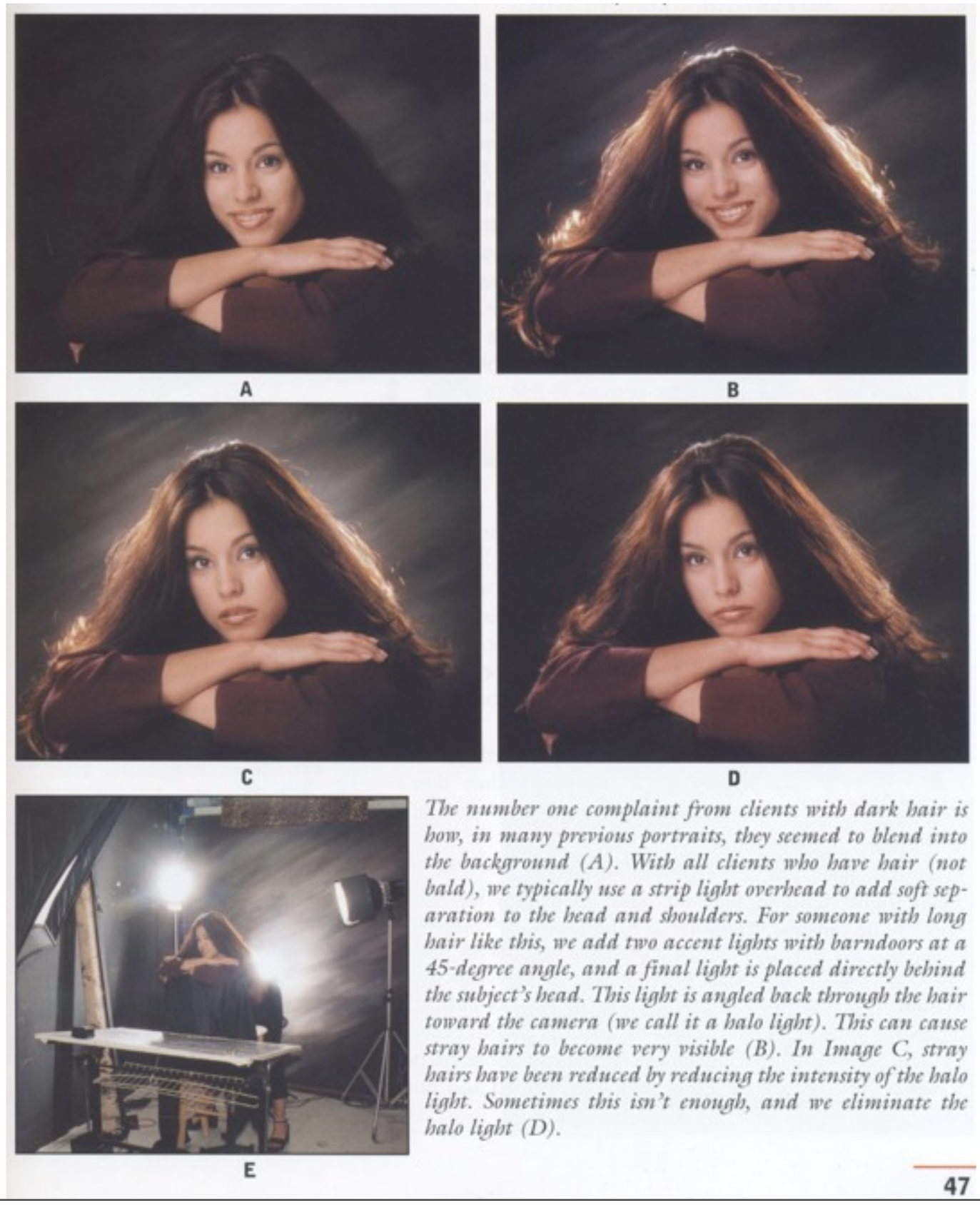
Umbrellas may be used as reflectors (light shining into the umbrella) or as diffusers (light shining through the umbrella). An umbrella is the cheapest way of creating a large, soft light source.

Windowlight
Apart from the obvious meaning of light through a window, or of light shone through a diffuser to look as if it is coming through a window, this is an alternative name for a soft box.

***Umbrella**
Exactly what its name suggests; used for modifying light.

Tungsten spot with shoot-through umbrella (Photon Beard)

Hair lighting



A

B

C

D

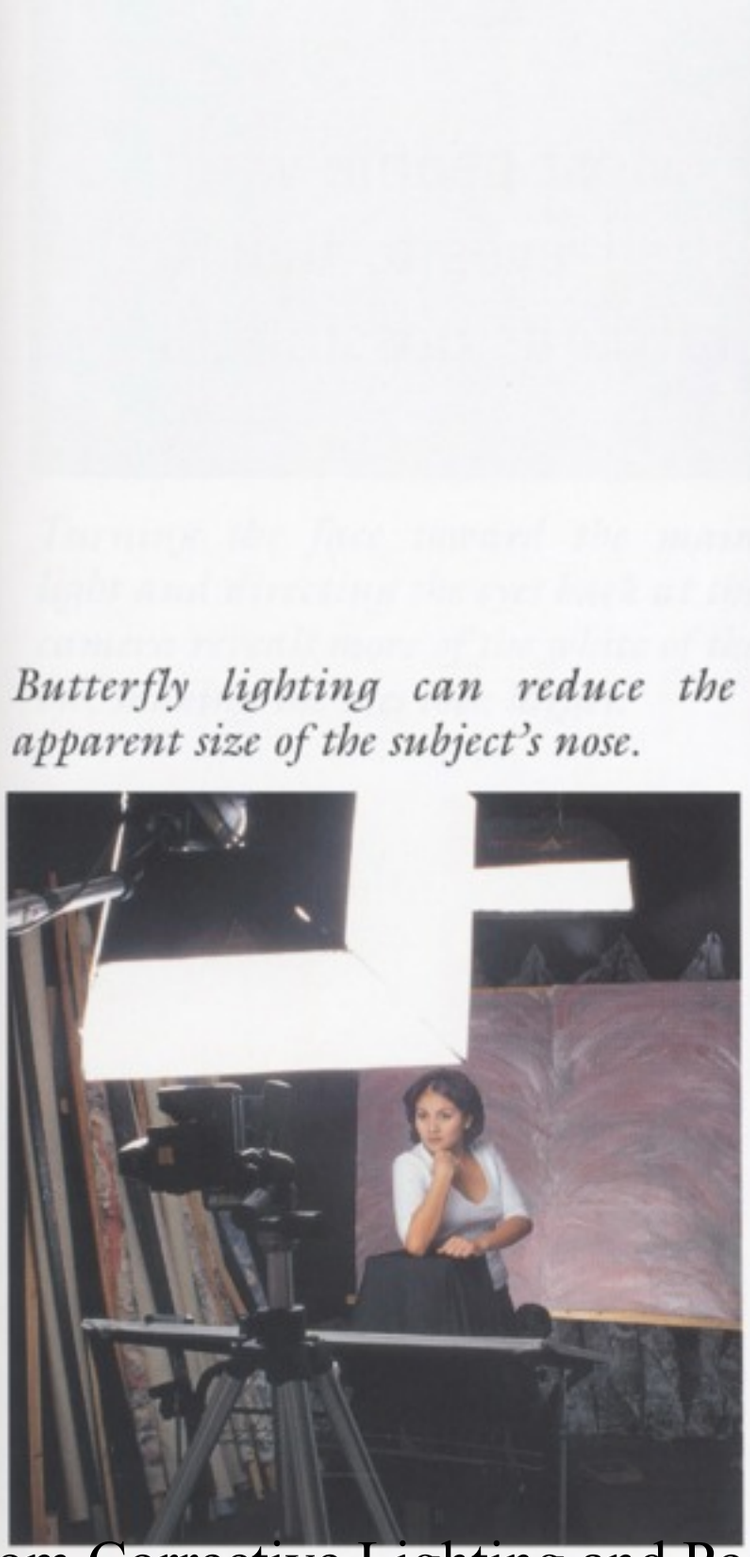
E

The number one complaint from clients with dark hair is how, in many previous portraits, they seemed to blend into the background (A). With all clients who have hair (not bald), we typically use a strip light overhead to add soft separation to the head and shoulders. For someone with long hair like this, we add two accent lights with barndoors at a 45-degree angle, and a final light is placed directly behind the subject's head. This light is angled back through the hair toward the camera (we call it a halo light). This can cause stray hairs to become very visible (B). In Image C, stray hairs have been reduced by reducing the intensity of the halo light. Sometimes this isn't enough, and we eliminate the halo light (D).

From Corrective Lighting and Posing

Lighting & nose

Butterfly lighting can reduce the apparent size of the subject's nose.



From Corrective Lighting and Posing

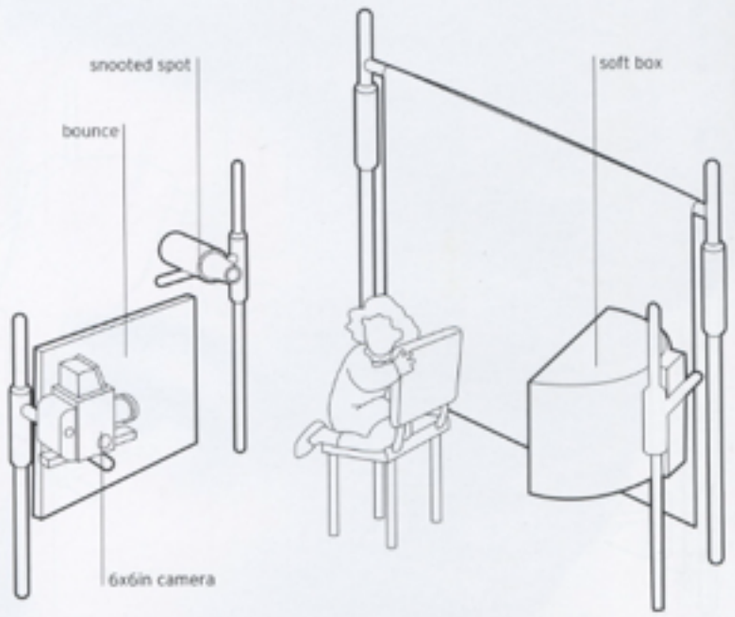
child

photographer **Dolors Porredon**

client	Studio
use	Poster
camera	6x6cm
lens	150mm
film	Kodak Vericolor 2
exposure	f/5.6
lighting	Flash: 2 heads
props and set	Painted backdrop

The face, the pose, the colours: all are reminiscent of a Victorian chromolithograph. The effect is achieved in large measure by careful control of the lighting ratio, while retaining as much chiaroscuro as possible.

Plan View



key points

- Catchlights in the eyes are not essential, but sometimes a picture that is lacking them will look curiously dead
- Traditional portraitists touched out all but a single catchlight. Today, multiple catchlights are acceptable if they are not too obtrusive

The key is a snooted spot to camera left, fairly close to the child's face and very slightly backlighting her. Opposite this, to camera right, is a 60x80cm (2x3ft) soft box. This is set to give quite a close lighting ratio, but because it is diffuse and the key light is highly directional, the impression of modelling is very clear: modelling is all the more clear, of course, because of the very careful angling of these two lights.

A white reflector to camera left, just out of shot, provides a little more fill to the front of the face but also creates the catchlights in the eyes. They would not be there otherwise: the key is a back light, and the fill is shaded from both eyes.

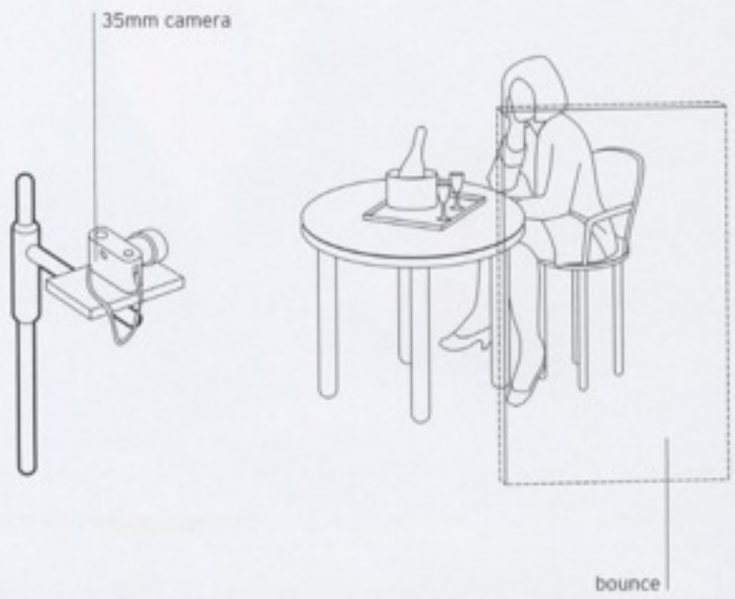
susan

photographer **Massimo Robecchi**

client	Studio Magazine
use	Editorial
model	Susan
assistant and stylist	Teresa La Grotteria
art director	Olga Stavel
make-up and hair	Gianluca Rolandi
camera	35mm
lens	300mm
film	Ilford XP2 ISO 400
exposure	1/100 second at f/2.8
lighting	Available light + bounce
props and set	Location

This picture well illustrates that an overcast day can be vastly superior to sunshine, especially if you are shooting in monochrome. With light coming more or less evenly from all directions, the tonality can be exquisite.

Plan View



key points

- Exposure is a subjective art: arguably, everything in this picture is just a tiny bit darker than it "really" is, but this holds the tones in the white clothing
- A 300mm lens, used wide open at f/2.8, allows the background to be subtly suggested rather than too clearly delineated

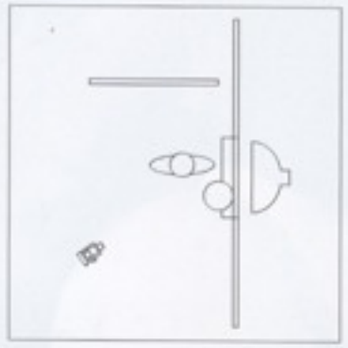
Even so, Massimo Robecchi added a white bounce in front of the model to even out the light still further: the white drop of the table-cloth is thereby brought nearer to the tone of the clothes and the background, and the dark stockings are made to read just a little better. This is one of those cases where a collapsible reflector such as a Lastolite or a Scrim Jim can be extremely useful – and where the effect is completely different from fill-flash, touted by camera manufacturers as the answer to everything.

niña detras de la ventana

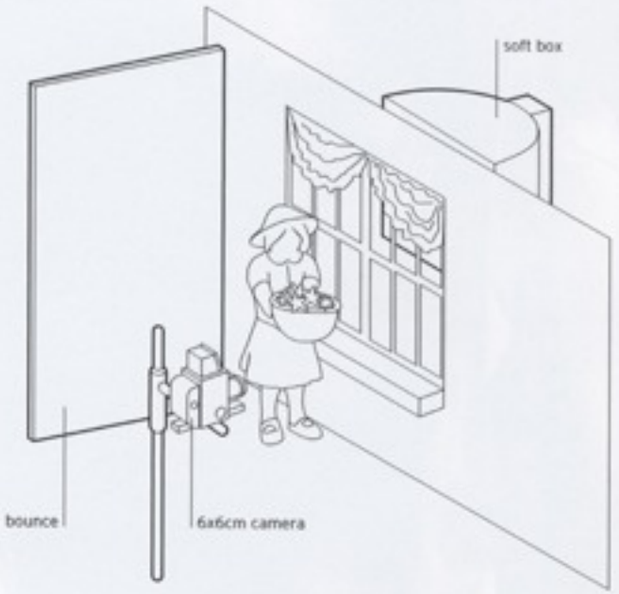
photographer **Dolors Porredon**

client	Studio
use	Poster
camera	6x6cm
lens	150mm
film	Kodak Vericolor III
exposure	f/8
lighting	Electronic flash: single soft box
props and set	Built set

A perfect moment, captured by chance – or careful planning? The latter, of course. The window is part of a built set, transilluminated with a 100x100cm (40x40in) soft box, supplemented only by a white bounce to camera left.



Plan View



key points

- Soft yet directional lighting is often very effective with children
- Flash is usually best for children, as they may screw up their eyes against tungsten lighting
- Some photographers believe that flash can damage the eyes of young children, but there is absolutely no evidence to support this: it seems to be an old wives' tale

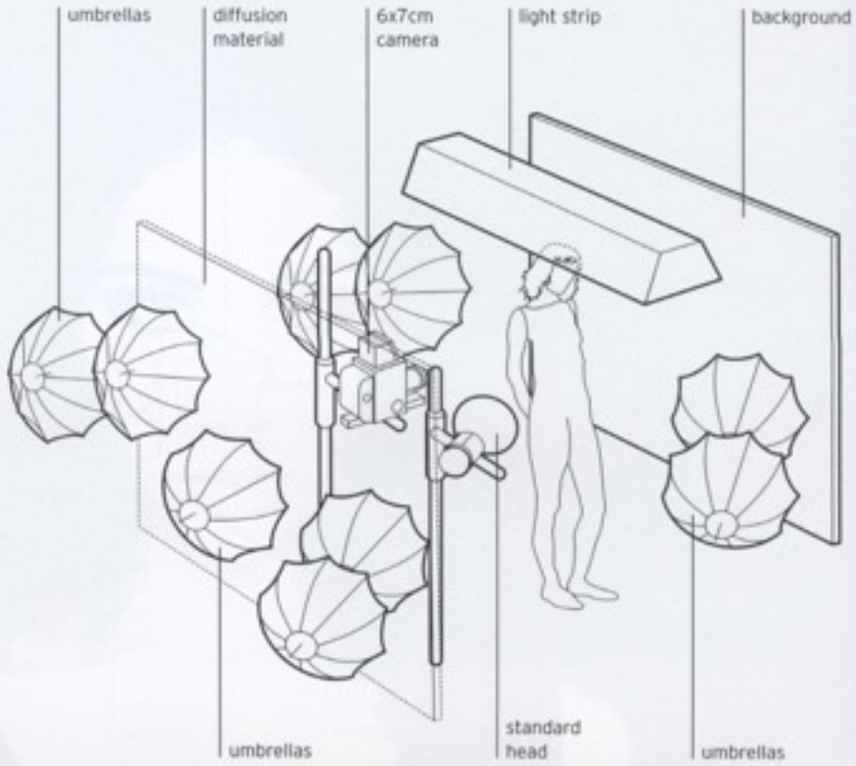
Although this was designed for a poster, the same techniques (and forethought, and organization) could equally be applied to a picture for less public consumption. Window sets are not particularly hard to build; a selection of hats can be kept at hand; the rest of the clothing is hardly elaborate, though the light colour emphasizes purity and innocence; and the lighting is elegantly simple. It is true that, often, surprisingly complex lighting set-ups are used to mimic simplicity; but it is also true that a simple lighting set-up can (if it is well executed) be remarkably effective. Diffuse light generally works very well with children, emphasizing the delicacy of their skin texture and the roundness of their features: "character" lighting is considerably more difficult before the features have reached their adult lineaments.

smile

photographer **Jeff Manzetti**

client	Grazia
use	Cover
model	Petra
hair	Lucia Iraci
make-up	Michelle Delarne
editor	Stefania Bellinazzo
camera	6x7cm
lens	135mm
film	Fuji EPL 160
exposure	f/4
lighting	Electronic flash

A large assortment of lights contribute to the dazzling look of this beautiful cover shot.



plan view

The dazzling smile and gleaming complexion are shown to good advantage as they are bathed in an even spread of light emanating from a virtual wall of light in the form of a series of umbrellas arranged in an arc behind and around the photographer. These all shoot through a curtain of diffusion material, softening and evening the effect on the subject. In addition to this is a key light, a daylight-balanced HMI to camera right, which is the only direct light on the model. It is positioned just high enough to give a gentle amount of modelling below the chin.

On the background are four more umbrellas, one pair on either side. The resulting lightness and evenness of a large part of the final image makes a good background against which the necessary cover text can 'read' clearly. A very mottled or light-and-dark image makes it difficult for text to show up well, and this is always a major consideration for a cover shot.

key points

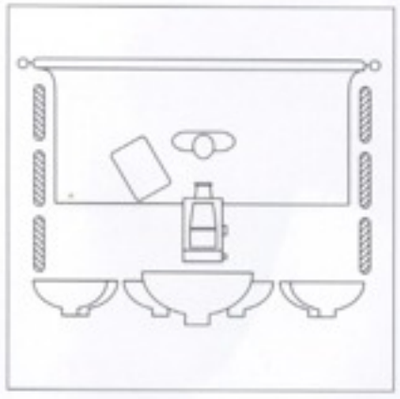
- The purpose of a shot will dictate aspects of the look and technique
- Using just a restricted range of saturated colours against a predominantly light or pale background can create a very strong impact

chinese hair

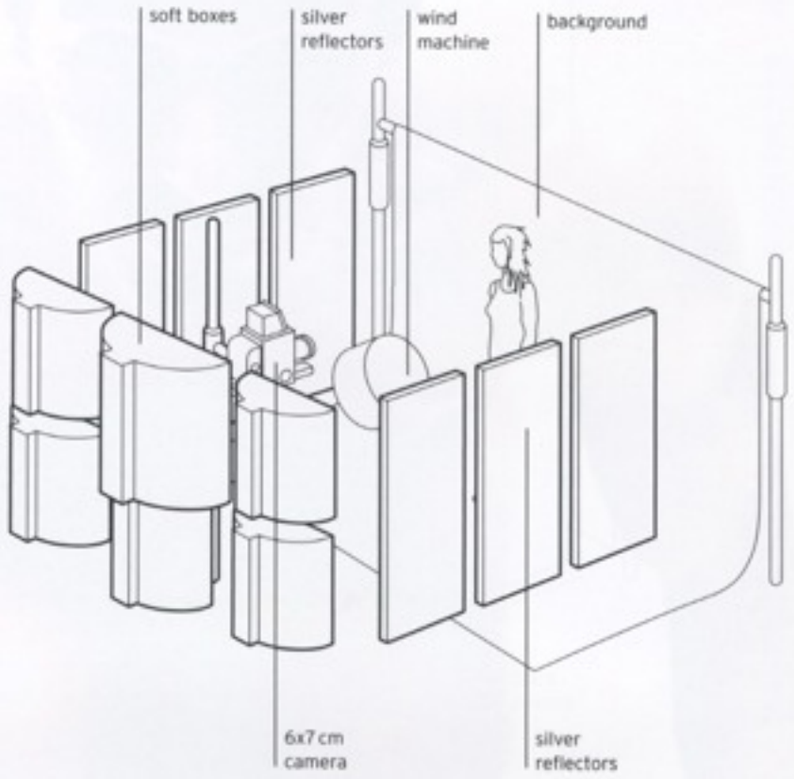
photographer **Frank Wartenberg**

use	Self-promotion
camera	6x7cm
lens	127mm
film	Fuji Velvia
exposure	Not recorded
lighting	Tungsten

There is no shortage of lighting equipment here. Frank Wartenberg has assembled an impressive array of soft boxes and silver styro reflectors, above, below and around the camera.



plan view



key points

- Modelling lights are normally tungsten, so bear this in mind when balancing sources
- Silver reflectors will produce more focussed light than white reflectors

The main light is a large soft box (used with the modelling light only) positioned behind the camera. Six smaller soft boxes are arranged on either side and below this, again using only the tungsten modelling light. These combine to give an even sheet of light across the subject.

On both sides is a selection of silver reflectors, effectively forming a wall to either side.

The resulting bright and even background provides a foil against which the strands of the model's hair, tousled by a wind machine, stand out in stark silhouette.

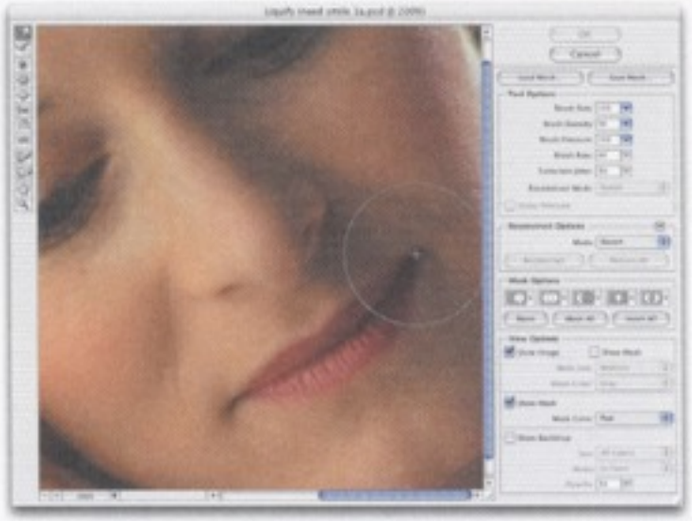
From Photographing People, Portrait, Fashion, Glamour

Hardcore Photoshop for portrait

- **View before/after**

figure 9.47

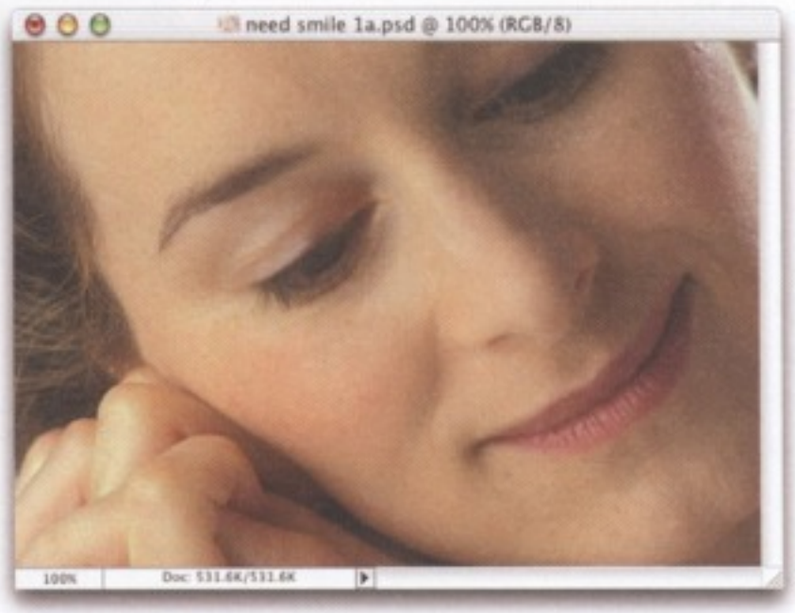
figure 9.48



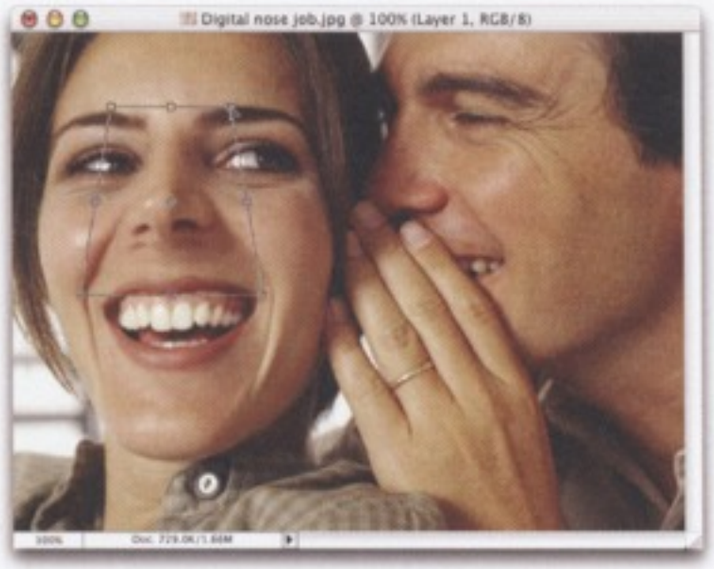
Step Three:
Press the Left/Right Bracket keys on your keyboard to adjust the brush size until it's about the size of the person's cheek. Place the brush near the corner of the mouth (as shown here), click and "tug" slightly up. This tugging of the cheek makes the corner of the mouth turn up, creating a smile.

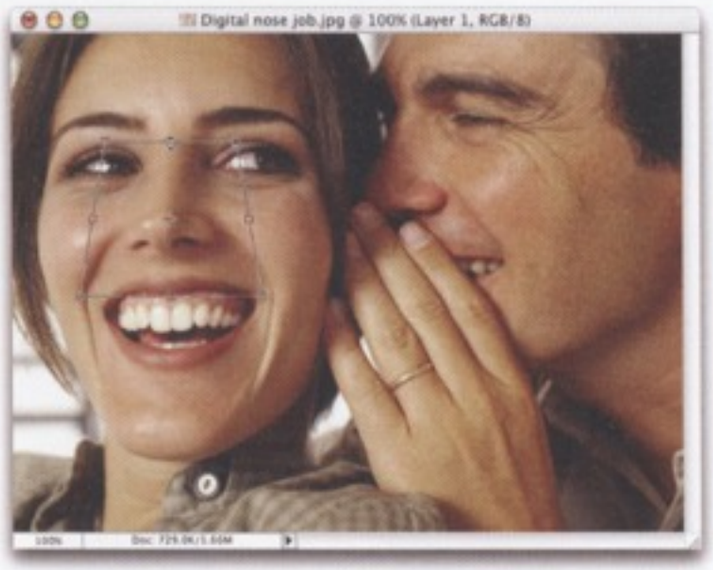
Step Four:
Repeat the "tug" on the opposite side of the mouth, using the already tugged side as a visual guide as to how far to tug. Be careful not to tug too far, or you'll turn your subject into the Joker from *Batman Returns*. Click OK in Liquify to apply the change, and the retouch is applied to your photo (as shown).

Before.



After.



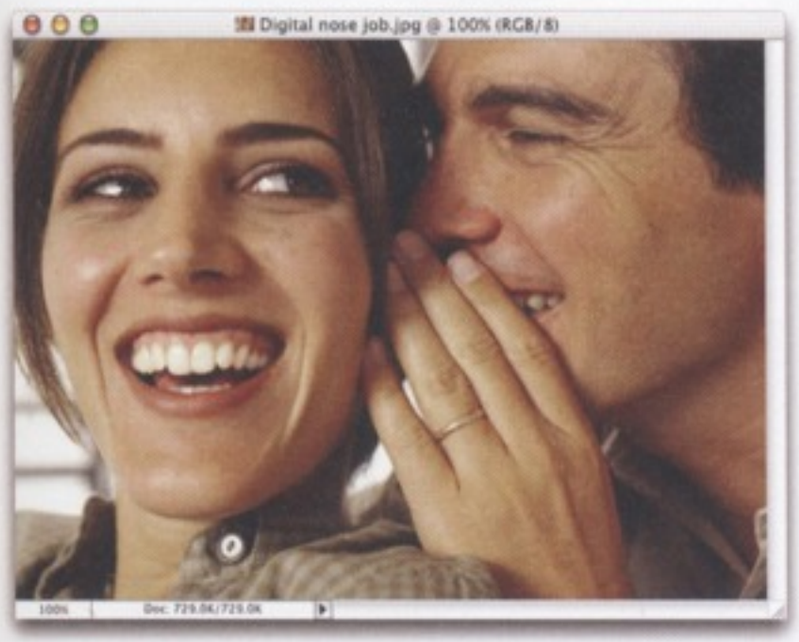


Step Four:

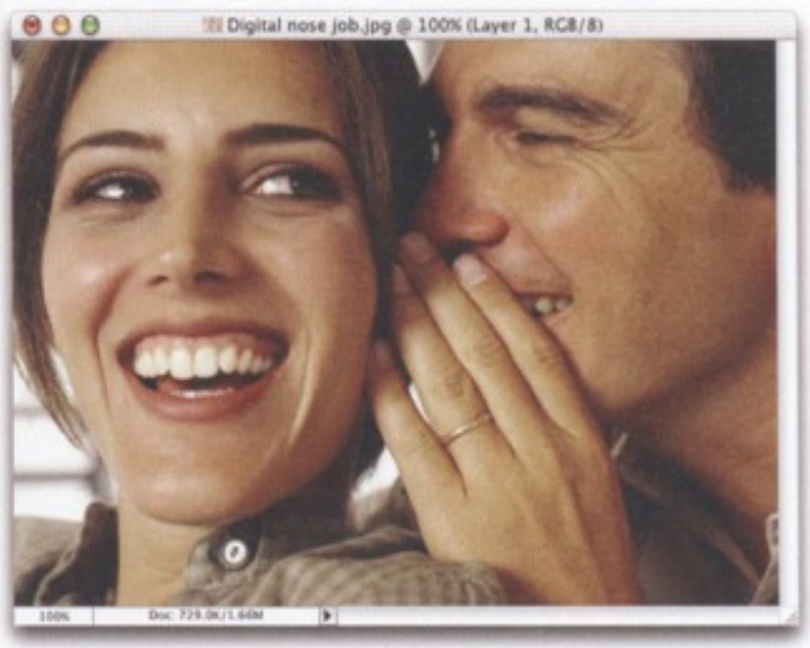
Press Command-T (PC: Control-T) to bring up the Free Transform bounding box. Hold Shift-Option-Command (PC: Shift-Alt-Control); then, grab the upper-right corner point of the bounding box and drag inward to add a perspective effect to the nose. Doing this gives the person a pug nose, but you fix that in the next step.

Step Five:

To get rid of the "pug-nose" effect, release all the keys, then grab the top-center point (as shown) and drag straight downward to make the nose look natural again, but now it's smaller. When the new size looks about right, press Return (PC: Enter) to lock in your changes. If any of the old nose peeks out from behind the new nose, click on the Background layer and use the Clone Stamp tool to clone away those areas: Sample an area next to the nose, and then paint (clone) right over it. Below, see the difference our 30-second retouch made in the image.



Before.



After.

Hardcore Photoshop for portrait

© Eric Kuaimoku

figure 9.35

figure 9.36

figure 9.37

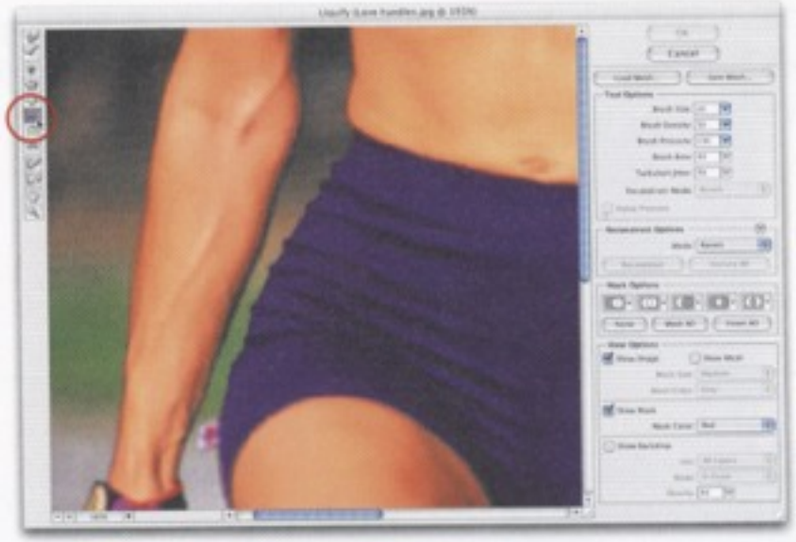
Selecting the entire left side of the image avoids potential artifacts.

figure 9.38

Dragging a Free Transform handle to narrow the selected area.

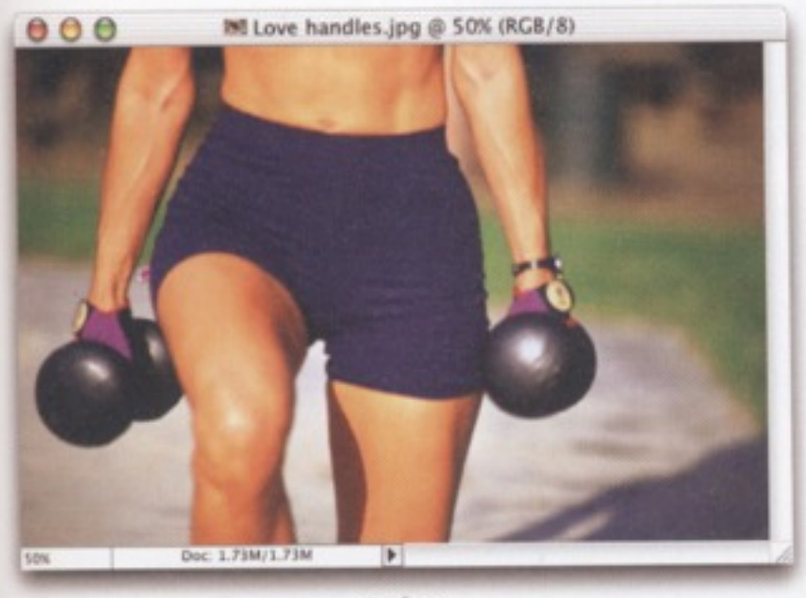
figure 9.39

The Liquify filter's Warp tool pushes pixels forward as you drag.

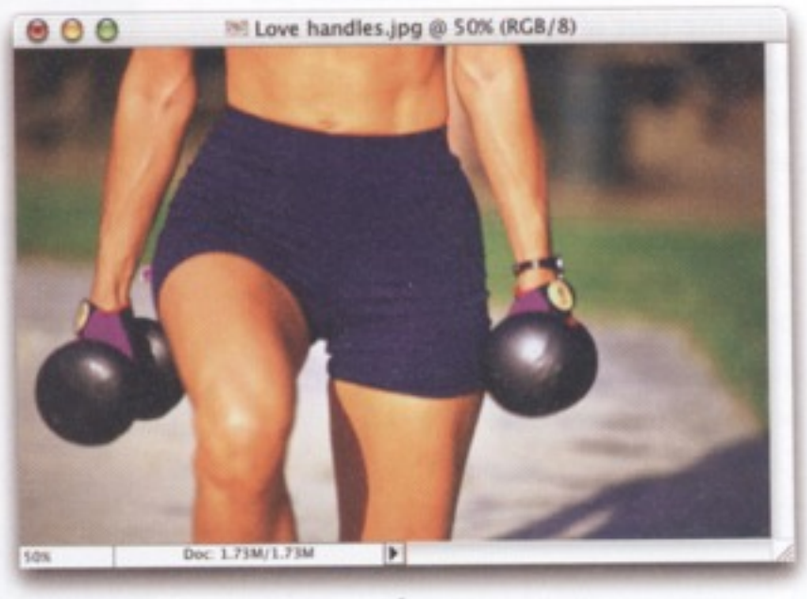


Step Three:
Get the Push Left tool from the Toolbar (as shown here). It was called the Shift Pixels tool in Photoshop 6 and 7, but Adobe realized that you were getting used to the name, so they changed it, just to keep you off balance.

Step Four:
Choose a relatively small brush size (like the one shown here) using the Brush Size field near the top-right of the Liquify dialog. With it, paint a downward stroke starting just above and outside the love handle and continuing downward. The pixels shifts back in toward the body, removing the love handle as you paint. (Note: If you need to remove love handles on the left side of the body, paint upward rather than downward. Why? That's just the way it works.) When you click OK, the love handle repair is complete.



Before.



After.

Touch-up: stretch and arm

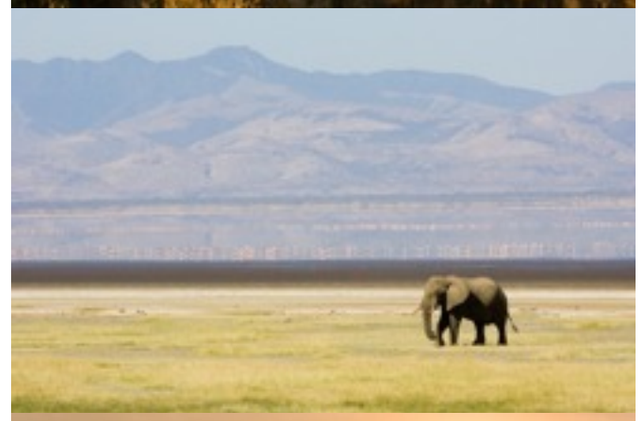
Untooning

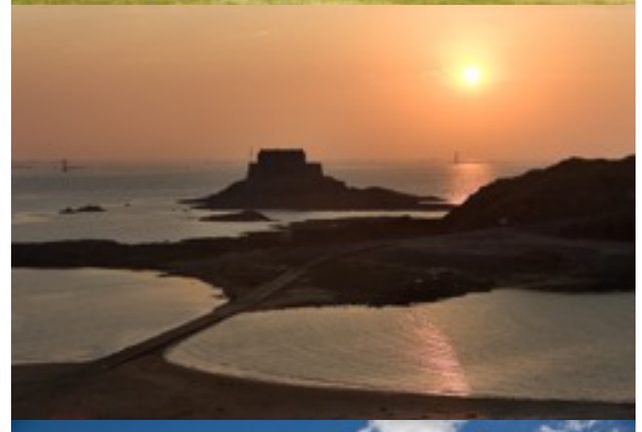
- **http://pixeloo.blogspot.com/2008/04/jessica-rabbit-process.html**
- **http://pixeloo.blogspot.com/2008/03/homer-simpson-untooned.html**
- **http://pixeloo.blogspot.com/2008/03/super-real-mario-world.html**
- **http://pixeloo.blogspot.com/2008/04/jessica-rabbit-untooned.html**
-

Landscape

Landscape / architecture

- **Get a foreground element**
  - rock, tree, flower
- **Rule of the thirds, diagonals**
  - in particular for the horizon
- **Don't hesitate to zoom in**
- **Manage dynamic range**
  - sky is always too bright
  - graduated neutral density, HDR
  - golden hours or right after sunset
- **Use a polarizer**
  - darkens the sky, make colors stand out
- **Alignments**
  - Keep horizon straight
  - For architecture, correct verticals
- **Don't be deterred by stormy weather**
- **Slow shutter speed for water**





Foreground helps

Boring

More interesting (foreground)

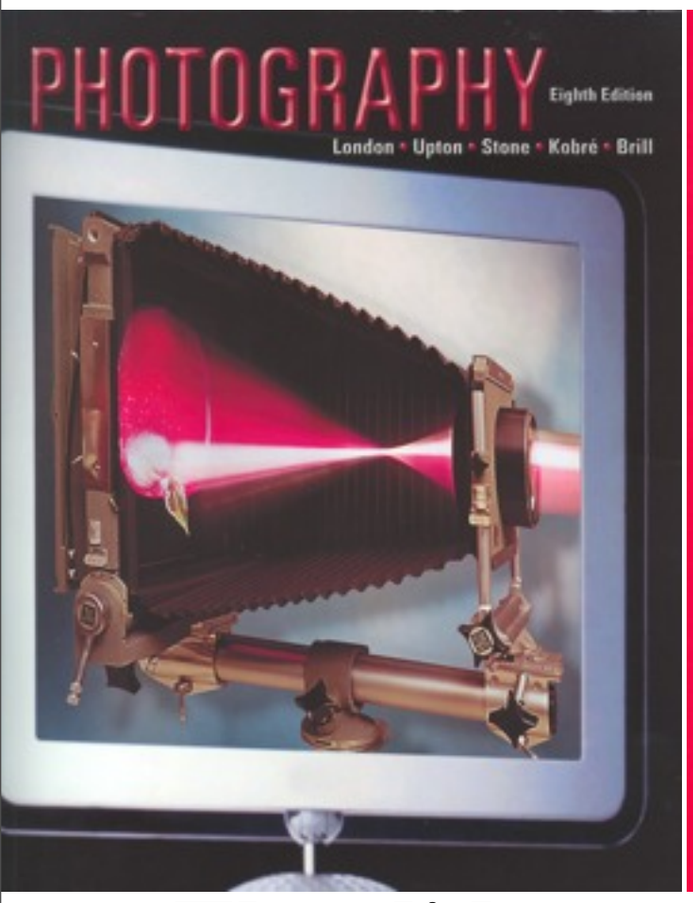
Parallels: do or don't

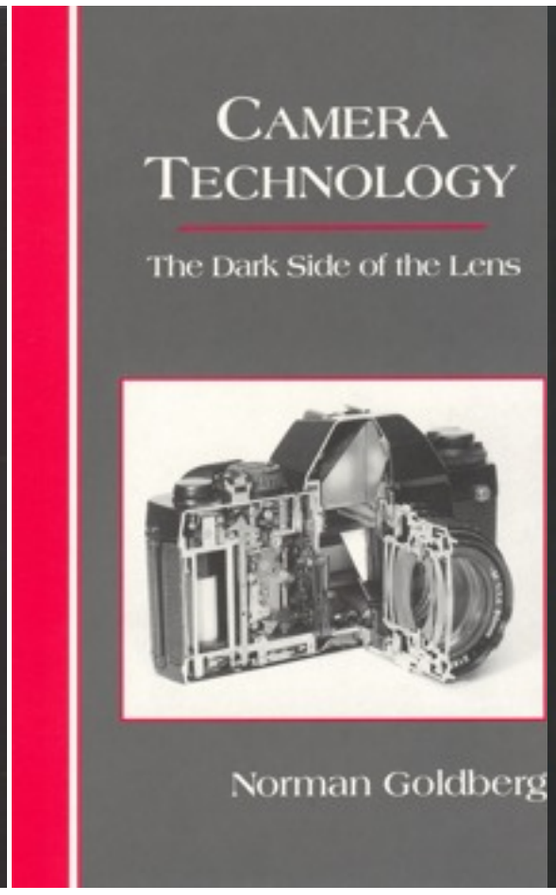
Ansel Adams

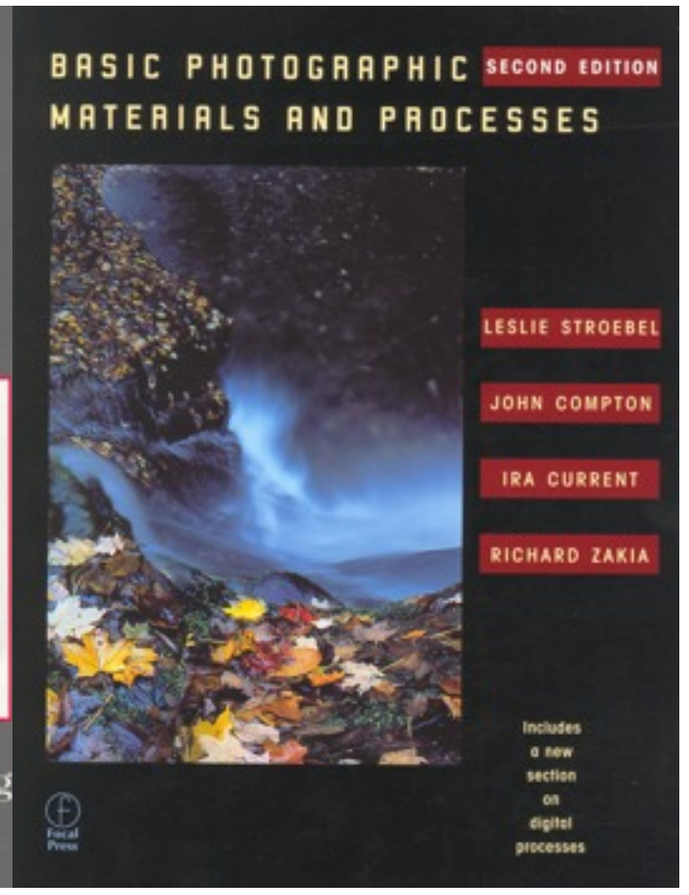
- Note foreground trees in lower right
- Sky has been darkened

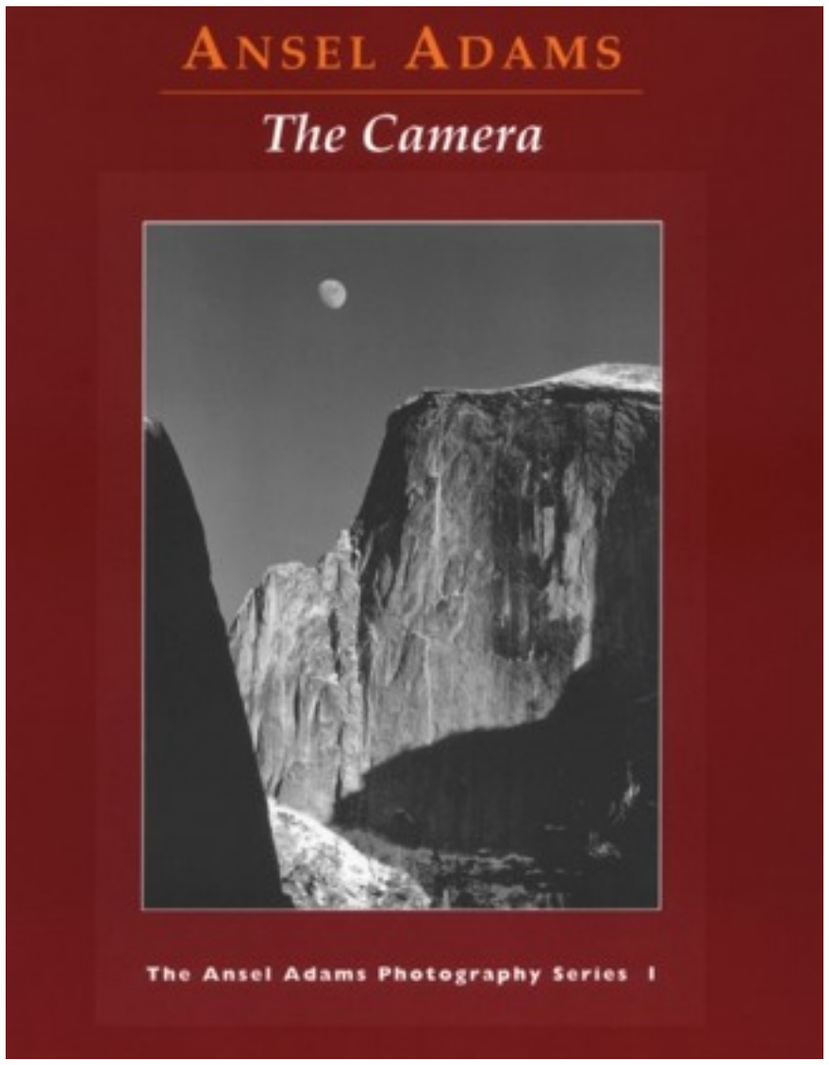
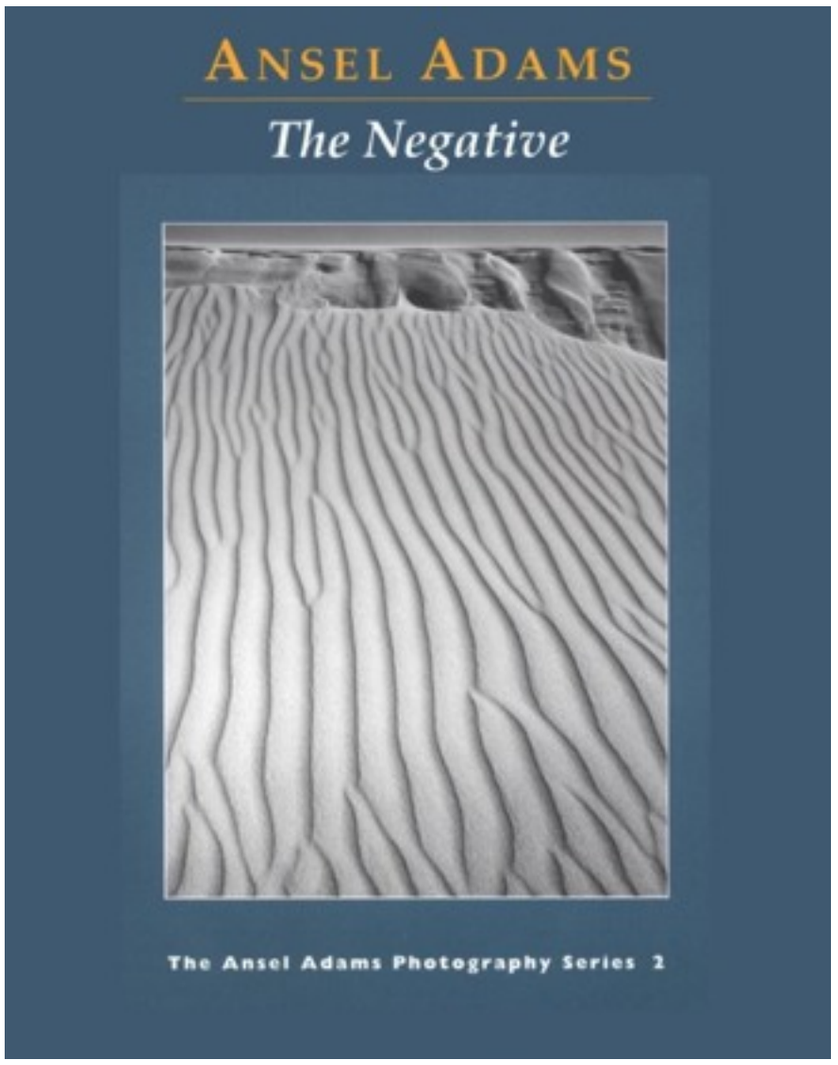
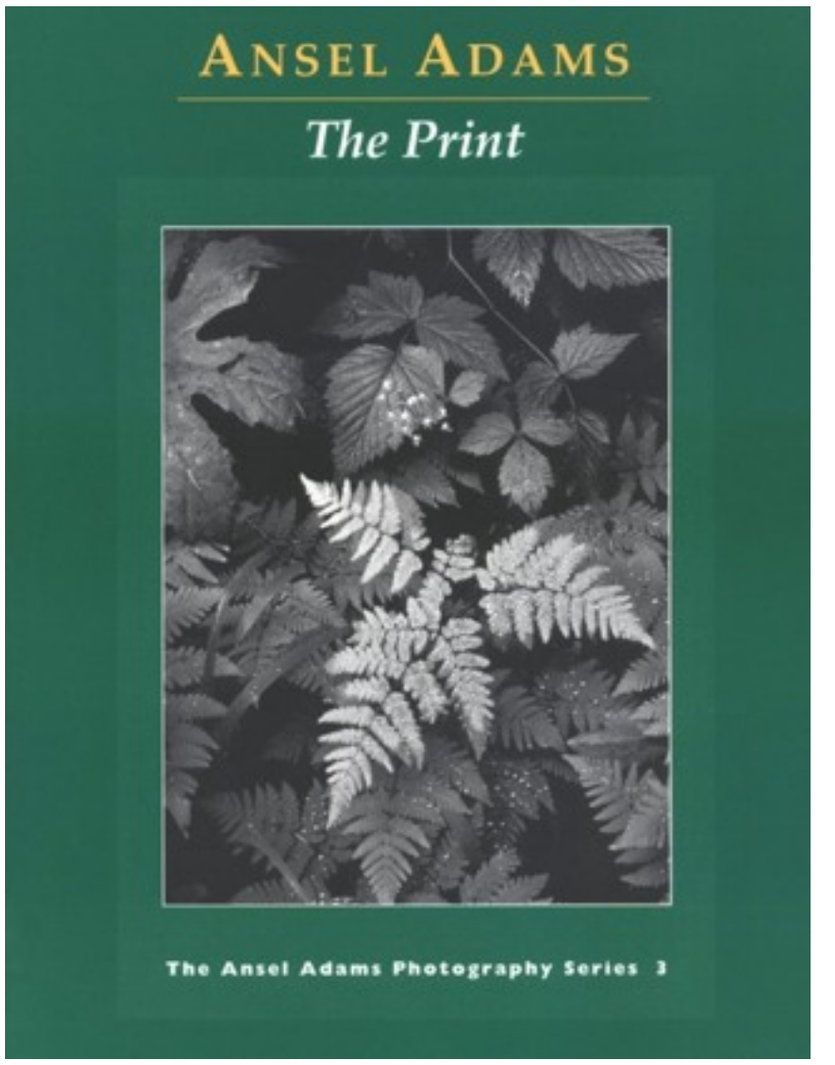
Reference

- http://courses.csail.mit.edu/6.869/lectnotes/lect1
- http://en.wikipedia.org/wiki/Lens_(optics)







- The slides use illustrations from these books

More references