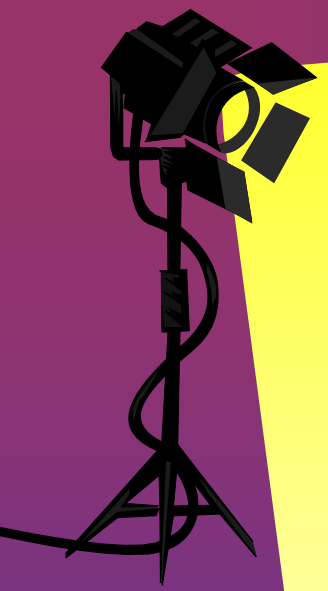
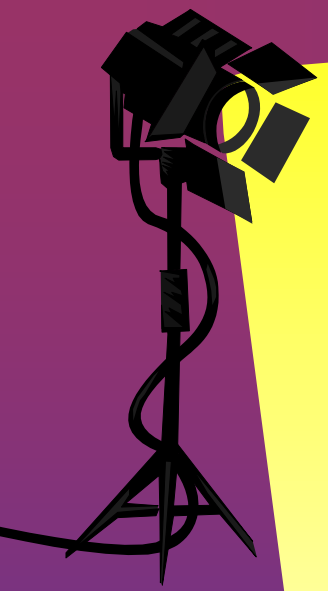


Digital Photography Seminars

A series of presentations to give the person new to digital photography an understanding of the basics needed to take good pictures



Schedule

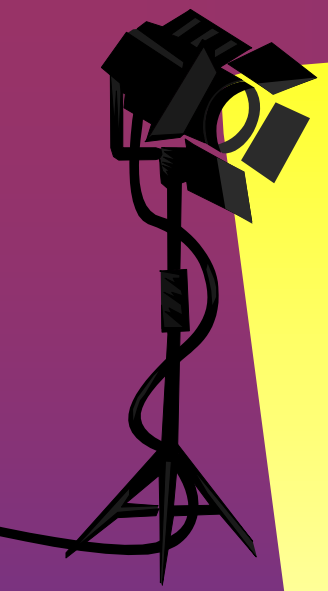
(2nd Saturday of every Month)

Date	Description
8-12-06	Digital Photography Fundamentals (the basics)
9-9-06	How to Pick a Digital Camera (criteria for selection
10-14-06	Session on Digital Cameras (Vendor Presentation)
11-11-06	Exposure and Lighting for Digital Cameras
12-9-06	Image Viewing Fundamentals
1-13-07	Digital Editing Software (Vendor Presentation)
2-10-07	Digital Camera Picture Taking (how to get a good digital image)
3-10-07	Printing Digital Images (Vendor Presentation)
4-14-07	Good Pictures (Summary of previous sessions)

Michael Glagola preferences & prejudices

1. PC not a MAC User
2. Serious amateur; not a professional
3. Loves 35mm SLR's; have several
4. Usually shoots slide film
5. Owns several P&S's; uses them for snapshots
6. Owns a digital camera; still waiting for the right DSLR
7. Finds no wide angle lens wide enough; telephotos are overrated
8. Loves nature photography and dabbles in portrait photography
9. When taking pictures, never leaves home without a tripod; owns several
10. Brackets every slide shot; gets 12 shots per roll of 36 exposures
11. Typically shoots 50+ rolls of slide film per vacation
12. Sorts images ruthlessly; very rarely shows images he does not <u>really</u> like
13. Shoots with a 11"x14" in mind as the final output
14. Knows how but does not like darkroom work
15. Owns lots of photo S/W; uses it because he has to not because he wants to
16. Believes photography is a skill (skill - knowledge reinforced with experience)
17. Believes there is no such thing as luck when it comes to photography; photographic luck is really excellent preparation combined with opportunity
18. Doesn't do video

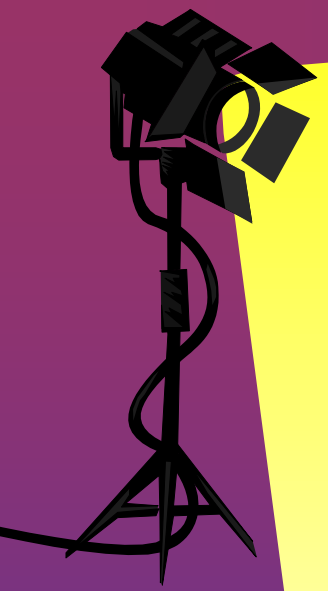
Digital Photography Fundamentals



Session Goals

To provide an understanding of the basics of

- Digital image terminology, formats and compression
- Digital camera technology
- Key Digital imaging issues



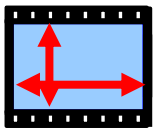
Agenda

- Establish a Baseline – Film Photography
- Digital Terminology, Image Formats & Compression
- Digital Camera Technology
- Digital Imaging Issues
- Q&A

Film Cameras

- Film Formats & Characteristics:
  - Color, B&W, Print, Slide
  - Various Sizes: APS, 35 mm, 645, 6x7, …
  - Distinct Color Palette
  - Film Speed/ISO & Grain
  - Latitude
- Cameras:
  - Point & Shoot, SLR
  - Autofocus & Autoexposure
  - Lots of controls
  - FAST! capable of up to 12 frames per second (fps)

Relative Film Sizes



APS

C - Traditional – 16.7x25.1mm
H - Wider – 16.7x30.2mm
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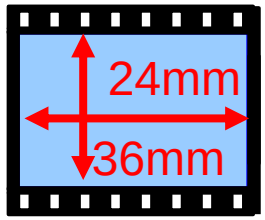
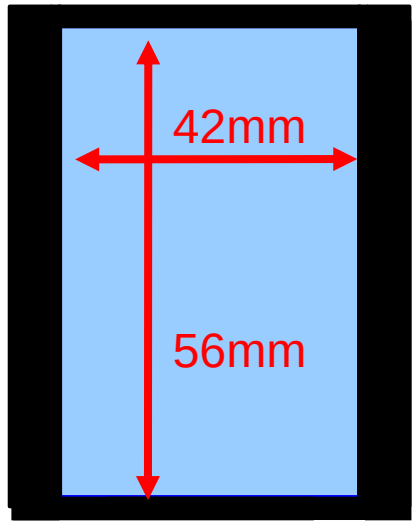
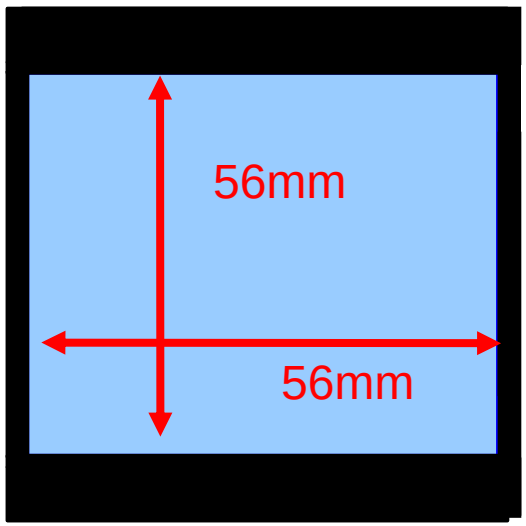


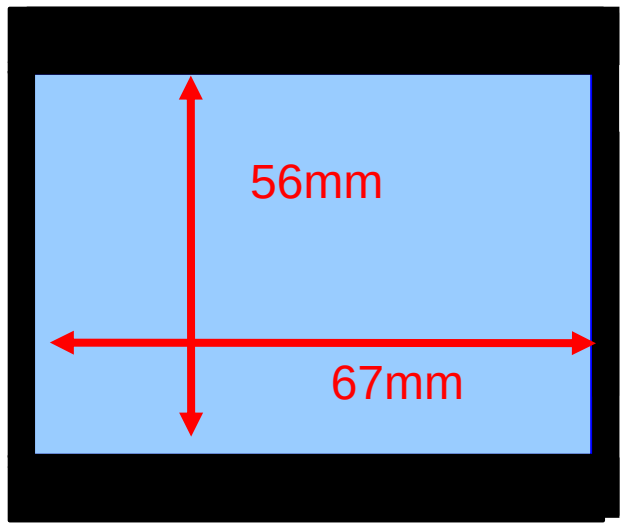
35mm



645

2¼ SQ
6X6

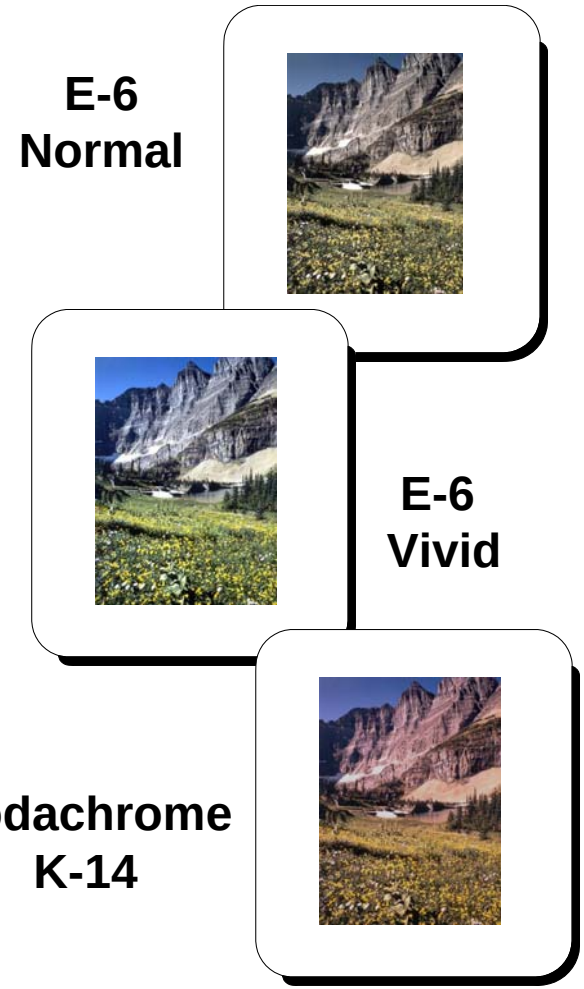




6X7

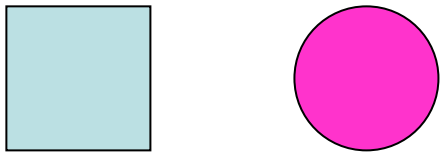
Film Color Palette

- Print Film & Slide Film - Film does not capture color like the human eye; different films are “tuned” for specific lighting (i.e. daylight, tungsten, fluorescent, …)
- Films have a “palette”: natural, vivid, warm, …
- Prints from print film can be easily adjusted during printing process; slide film has far less flexibility



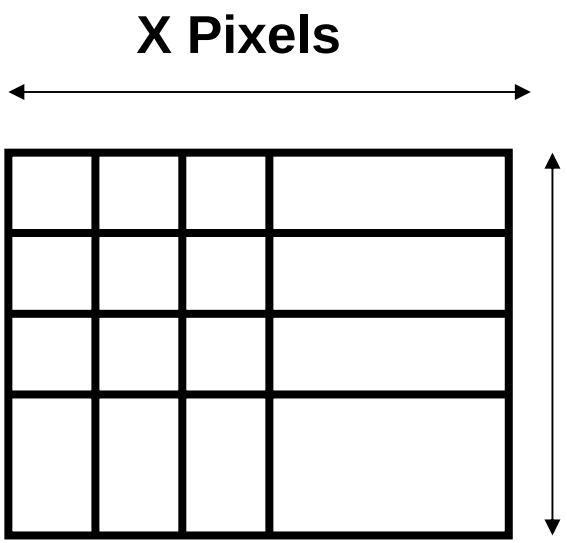
Film Speed & Grain

- ISO - measure of sensitivity to light; bigger the number the more sensitive the film (100, 200, 400, 800, 3200)
- **Sunny 16 Rule: 1/ISO @ f16 on a sunny day is "correct" exposure**
- Each doubling of ISO = 50% less light (-1 EV)
  (1/125 sec @ f16/ISO 100;1/250 sec @ f16/ISO 200)
- Grain - size of the individual "crystals" in film emulsion; the lower the ISO, the better the grain, & sharper the image (the film counterpart of a "pixel")
- Selecting film speed is a trade-off based on needs, conditions, and quality desired



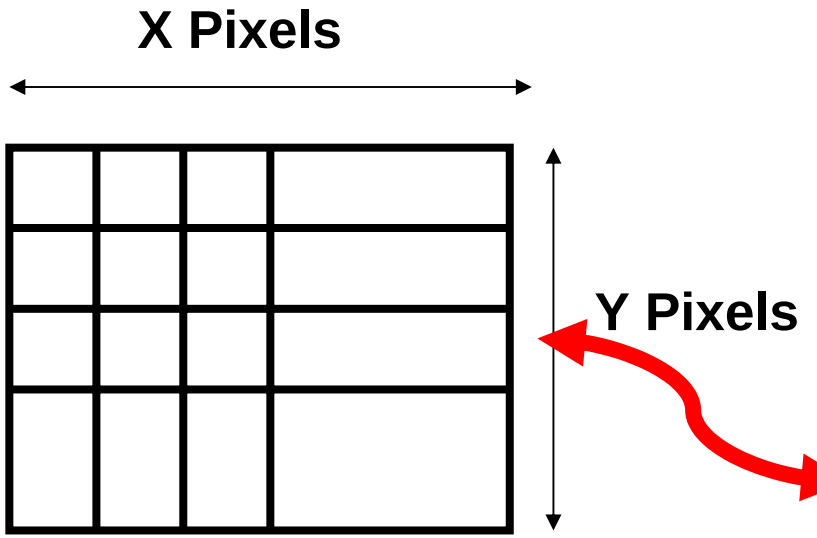
Basic Digital Image Definitions

- Pixel - An abbreviation of the term 'picture element.' A pixel is the smallest picture element of a digital image. A monochrome pixel can have two values, black or white/0 or 1. Color and gray scale require more bits; true color, displaying approximately 16.7 million colors, requires 24 bits for each pixel. A pixel may have more data than the eye can perceive at one time.
- Dot – The smallest “unit” that a printer can print.
- NOTE: A Pixel is NOT an Dot!!!!!!!!!!!!



What is a Digital Image?

- Collection of pixels laid out in a specific order with width (x) and height (y) in pixels
- Each pixel has a numerical value which correspond to a colour or gray scale value
- A Pixel has no absolute size; pixels ***MAY (sometimes NOT always)*** have a spatial value (Spatial data is data associated with the pixels that provides information about the size of the objects in the image).



How is a Digital Image Stored?

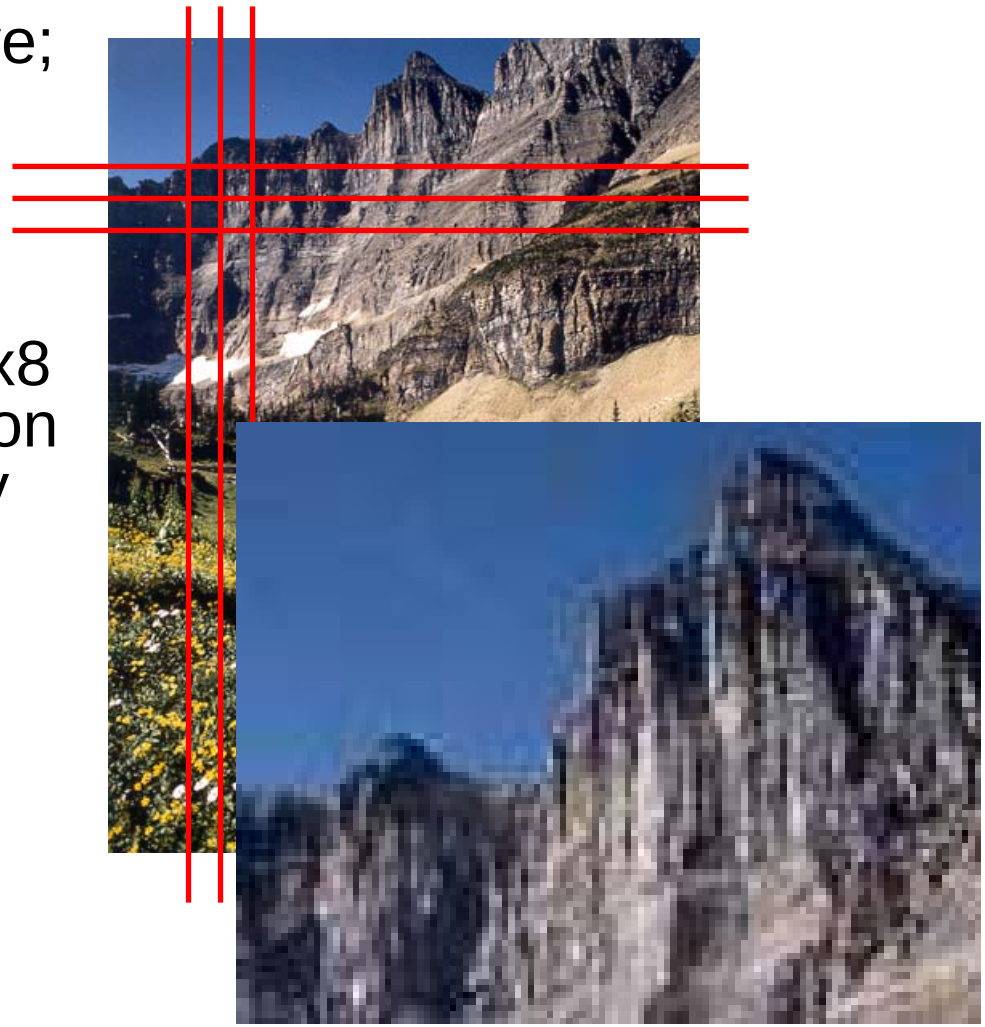
- File format which defines the components of the digital image (x & y values, values of the pixels, colour/gray scale, compression, manner in which the pixels are laid out, etc.) and provides for the storage and redisplay of the digital image
- Standard file formats provide for the exchange of digital image information
- Many file formats exist
- May be lossless or lossy
- May have associated image metadata

Examples of Digital Image Formats

- RAW – raw uncompressed data provided by source device; normally proprietary; note RAW usually data “as is/unfiltered/unchanged” from data source
- TIFF – desk-top publishing/document standard with over 50 different distinct subtypes
- JPEG – compressed raster image standard; based on DCT
- JPEG 2000 – new compressed raster image standard; based on wavelet compression
- GIF – vector graphics standard; supports only 256 colours
- BMP – Windows uncompressed image standard
- Proprietary – image standard unique to one company; often used as intermediate image standard for preservation of image data during editing (.psp, .psd, .pdd, …)

JPEG – the current “standard”

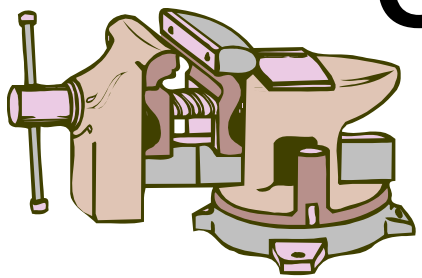
- JPEG exploits known limitations of the human eye; small color changes are perceived less accurately than small changes in brightness.
- Divides image into small 8x8 pixel “squares” and works on each square independently of any other square
- Leaves artifacts especially on edges and often on boundaries of “squares”
- JPEG can vary quality of image stored by adjusting rates of compression & sampling



Compression

35 MB

+



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2.4 MB

- Image Compression: algorithms that reduce the amount of data associated with each pixel without degrading the quality of the image to an unacceptable level. Compression reduces the size of pixel data; it does not change the number of pixels in an image
- Algorithm examples: JPEG (DCT), Wavelet, LZW, …
- Compression algorithms work differently on different image types; no algorithm is optimal for all images.
- Storage of an image in a lossy compressed image format reapplies compression every time the image is stored; effect is cumulative and data loss is permanent!!

Raw Image Format Example

12/16 Bit Image File Format

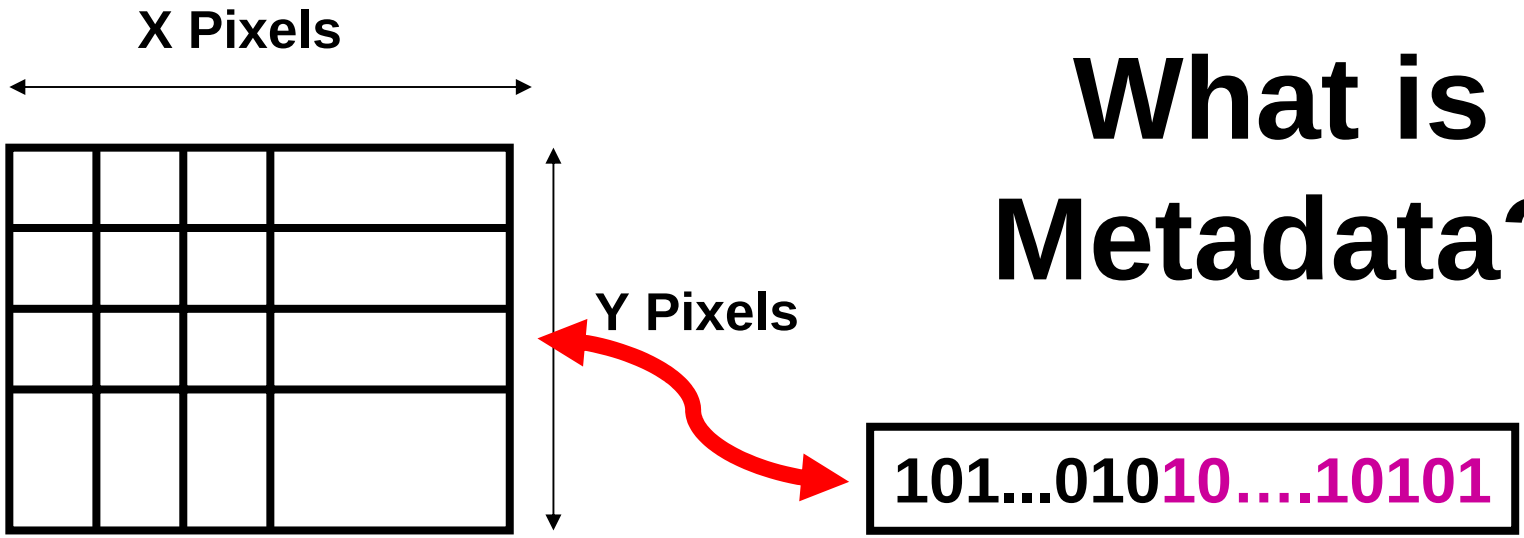
Header

X-Resolution (2 Bytes)	Y-Resolution (2 Bytes)	Minimum Pixel Value (8 Bytes)	Maximum Pixel Value (8 Bytes)

Image Data

First Row of Image Data (2 x X-Resolution Bytes)
Second Row of Image Data (2 x X-Resolution Bytes)
●
●
Last Row of Image Data (2 x X-Resolution Bytes)

File Size = [2 x (X-Resolution x Y-Resolution) + 20] (Bytes)



What is Metadata?

- Data in the image file that is about image data
- Examples of image metadata:
  - Type of camera, f-stop, shutter speed, colour bias, date image taken, …
  - Scanner type, spi, date image taken, …
  - Software that modified the image, date of modification, who modified image, …
  - Digital watermark
- File formats are adopting detailed metadata standards that provide detailed contextual information on an image

Metadata Example 1

Original date/time: 2006:07:13 14:18:46
Exposure time: 1/350
F-stop: 5.6
ISO speed: 64
Focal length: 7.8000
Focal length (35mm): 38
Flash: Not fired
Exposure mode: Auto
White balance: Auto
Orientation: Top-left
Light source: Unknown
Exposure bias: 0.0000
Metering mode: Pattern
Exposure program: Normal
Brightness: 9.4000
Digitized date/time: 2006:07:13 14:18:46

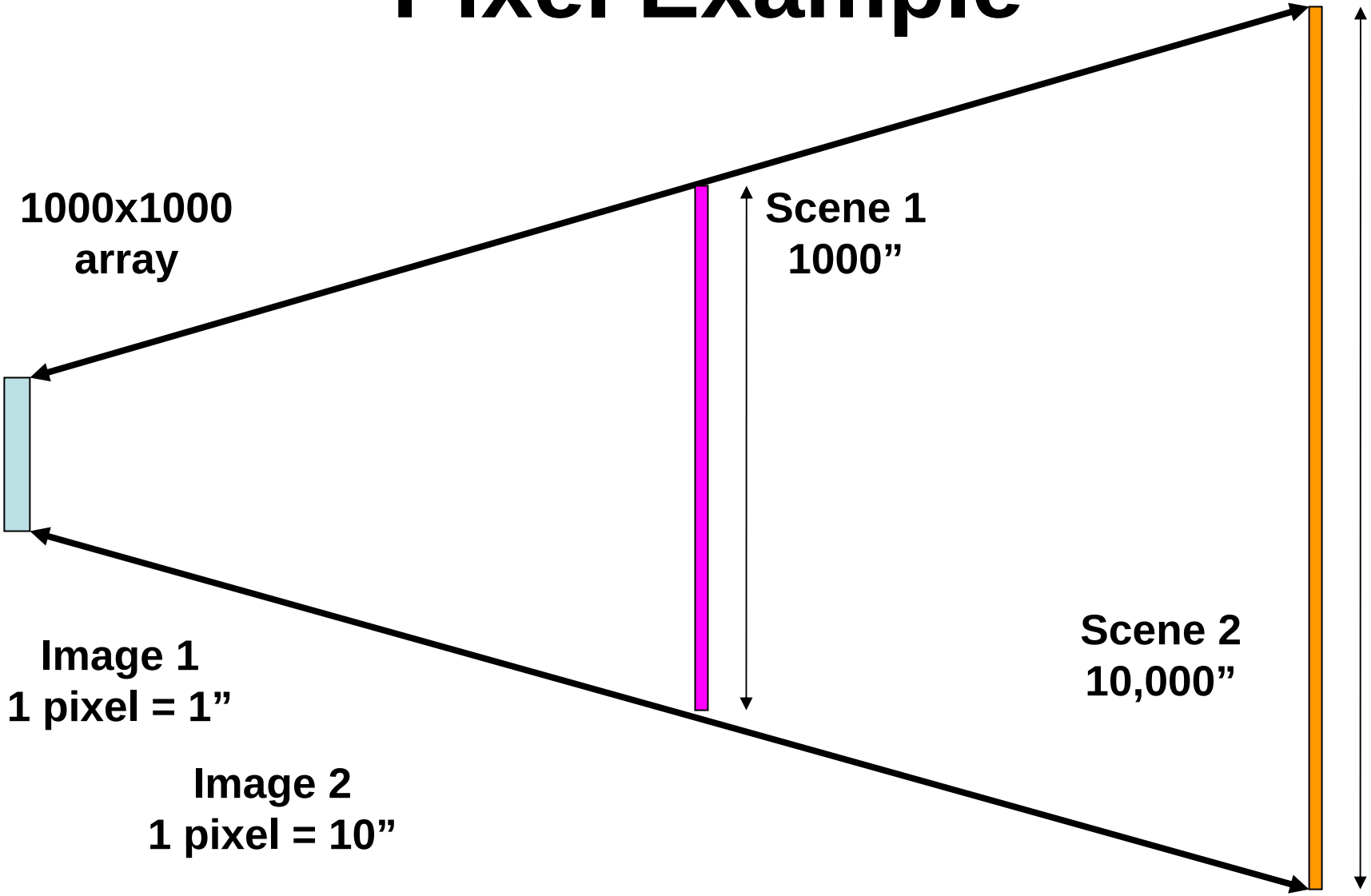
Metadata Example 2

Original date/time: 2006:07:13 14:19:04
Exposure time: 1/180
F-stop: 5.6
ISO speed: 64
Focal length: 10.3000
Focal length (35mm): 50
Flash: Not fired
Exposure mode: Auto
White balance: Auto
Orientation: Top-left
Light source: Unknown
Exposure bias: 0.0000
Metering mode: Pattern
Exposure program: Normal
Brightness: 8.6000
Digitized date/time: 2006:07:13 14:19:04

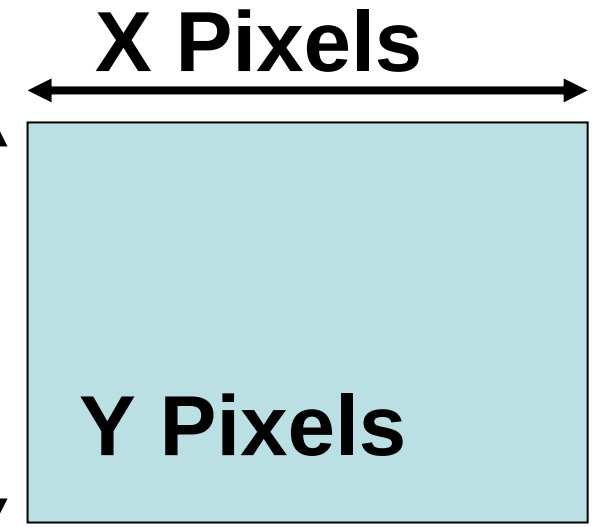
What is Spatial Data?

- Metadata associated with image that provides information about the size of the objects in the original image
- Examples:
  - Scanner SPI
  - Data based upon information implied-in and derived-from the image
- Digital Cameras do NOT capture Spatial Data!!!!

Pixel Example



So What is Image Resolution?

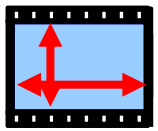


- Digital Image Resolution is the pixel size of the image: x pixels by y pixels
- **May or may not** be related to some discrete pixel size value or spatial resolution data
- IT IS NOT described as PPI/DPI/SPI **EXCEPT** in the context of a specific display, printer, or capture device

Digital Camera Technology

- CCD Sensor: 2/3 to full size 35mm frame; 3 to 14 MP
- Multiple size & format outputs
- Point & Shoot, SLR, …
- Distinct Color Palettes
- Exposure Speed/ISO
- Latitude
- Autofocus & Autoexposure
- Rarely “shoot” as fast as film cameras; 3-5 fps high end only
- High power usage; use lots of batteries

Digital CCD Size



APS

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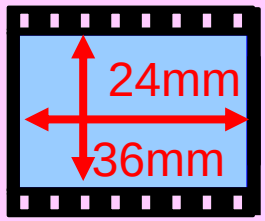
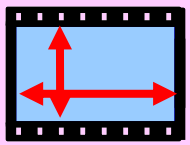
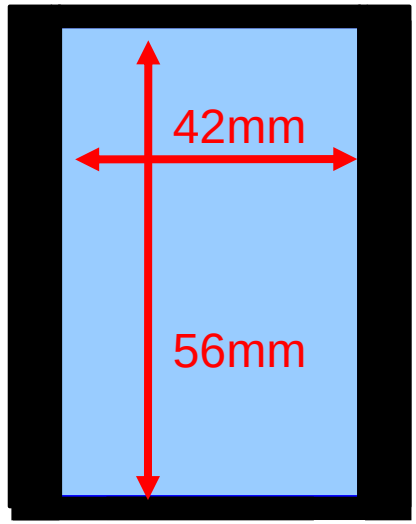


35mm



Digital CCD

Digital CCD typically about 1/3 less area than 35mm
Example: 15.6x23.7mm



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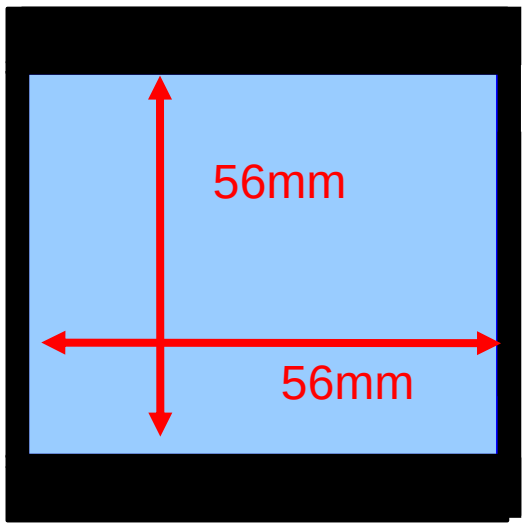
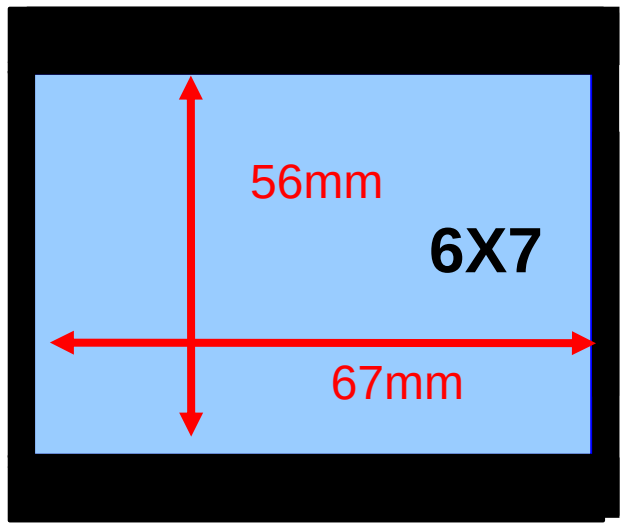
2¼ SQ/6X6





Digital Color Palette

- CCD does not capture color like the human eye; “tune able” for specific lighting (i.e. daylight, tungsten, fluorescent, …) CCD response differs between manufacturers
- Palette, Contrast, & Brightness able to be manipulated on camera and in software
- A color checker provides a reference point; cameras, monitors, and printers vary in color response; calibration helps

Digital Camera Shutter Speed & Pixels

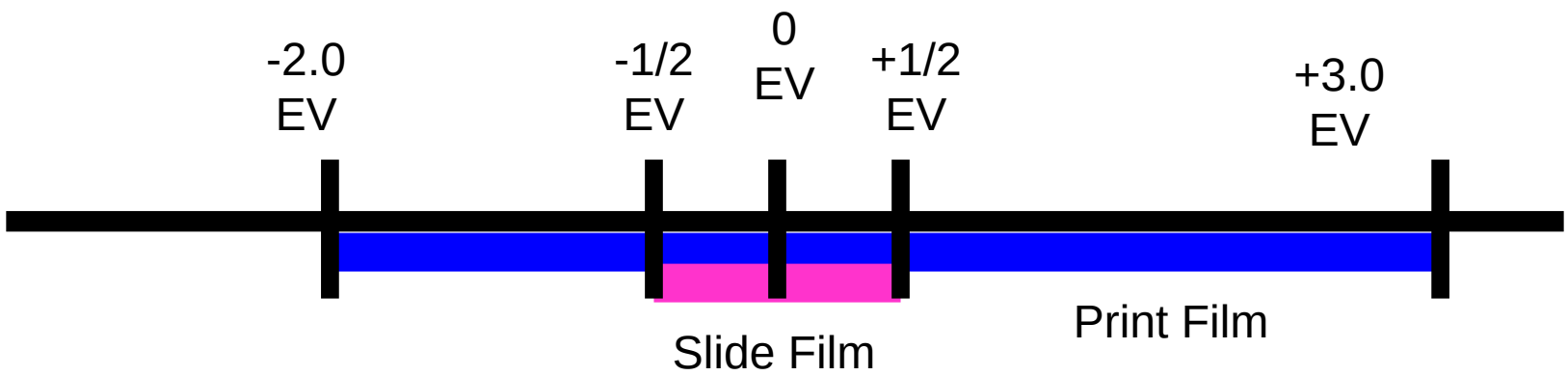
- Fundamentally similar to film cameras; big difference - able to review picture immediately
- Adjustable film speed; higher ISO - faster exposure but more “noise” in image (less quality)
- Exposure controls can be adjusted for complex lighting (highlights/shadows/contrast) and color bias (color mode & saturation)
- Able to adjust pixel size of image; larger pixel count - slower “exposure time lag” but sharper the image
- Time lag between exposures highly dependent on “storing” image data
- Camera settings a trade-off based on needs, conditions, and quality desired

Exposure Latitude – What is it?

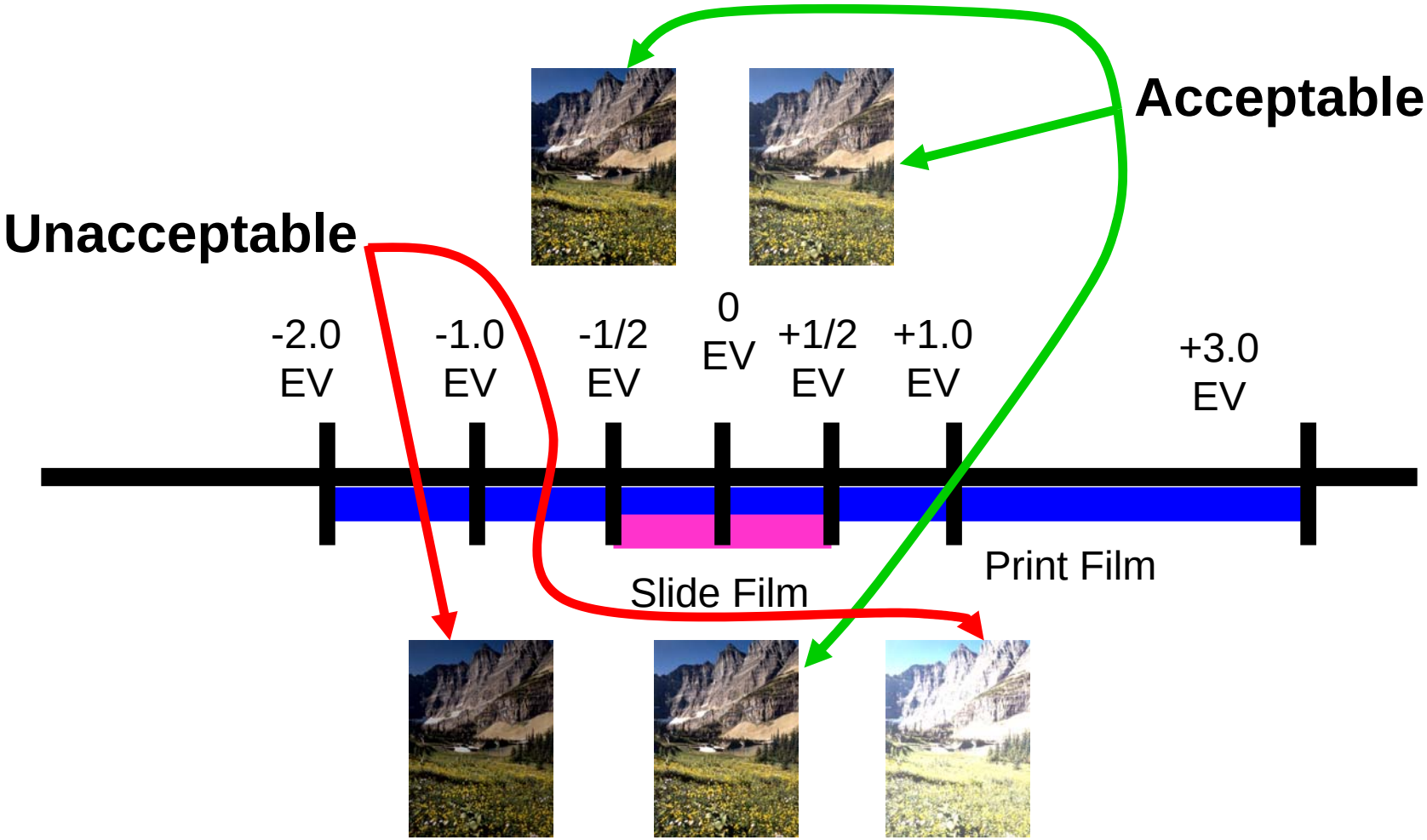
- Correct exposure - satisfactory detail in both the deepest shadows and brightest highlights; More than a single exposure combination (f-stop/shutter speed) can produces this result
- “Minimum” exposure - good tone separation just attained in the deepest shadow
- “Maximum” exposure – good detail just retained in brightest highlight
- Exposure beyond “min” - shadow details “block up”
- Exposure beyond “max” – highlight details “flatten out”
- Range between “min & max” exposures is LATITUDE

Film Latitude

- The exposure range at which an acceptable photograph is obtained; note: acceptable in both shadows AND highlights!
- Print Film: up to 5 EV; expose for the shadows
- Slide Film: up to 1 EV; expose for the highlights

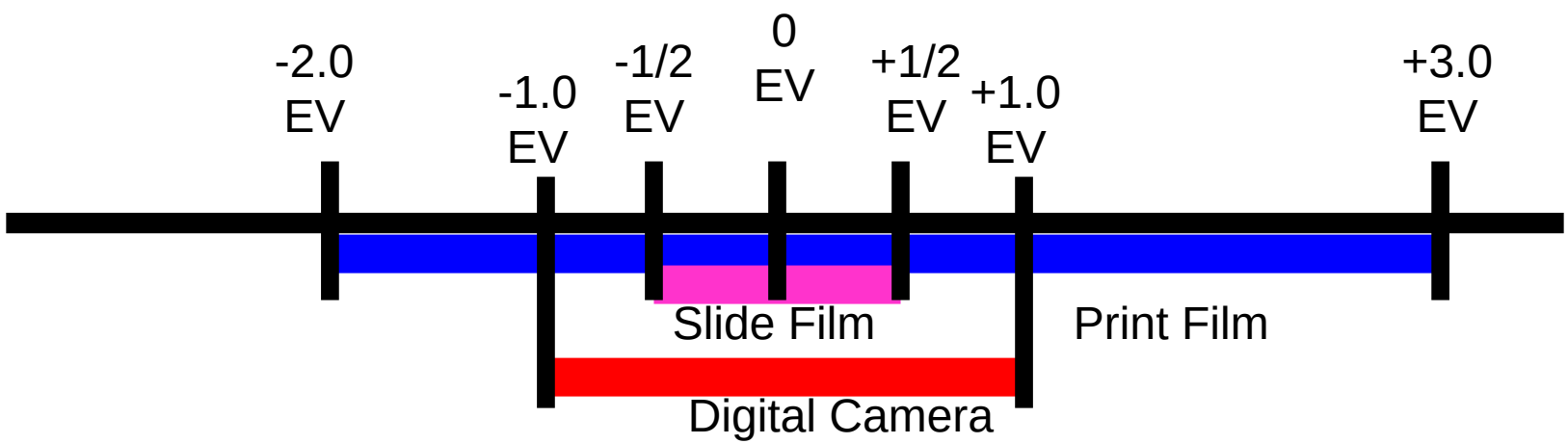


Slide Film Latitude Example



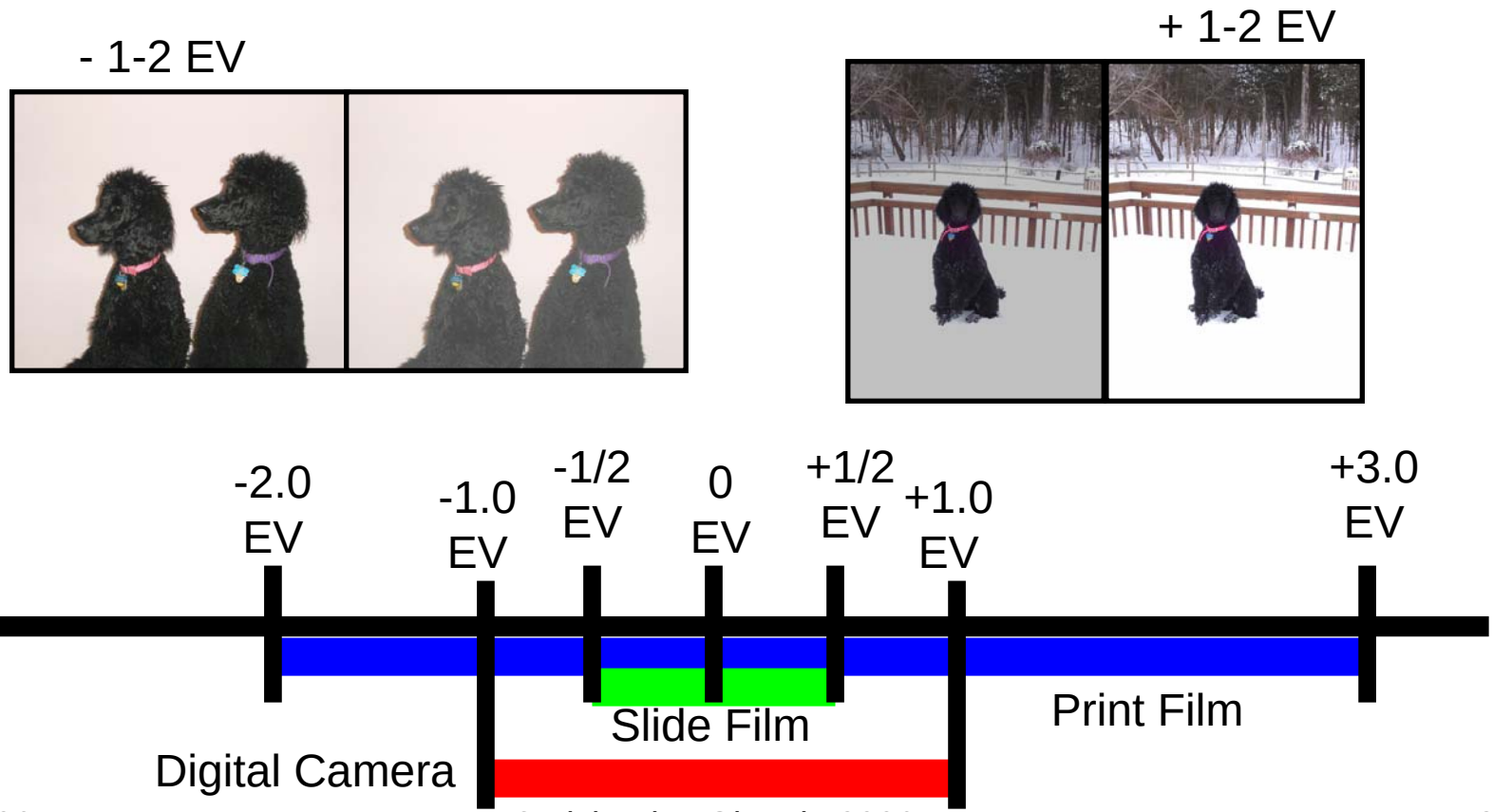
Digital Camera Latitude

- The exposure range at which an acceptable photograph is obtained; note acceptable in shadows AND highlights!
- Print Film: up to 5 EV; expose for the shadows
- Slide Film: up to 1 EV; expose for the highlights
- Digital Camera: up to 2 EV; **expose for "what's important"**



Digital Camera Latitude Example

- Use understanding of latitude to take good pictures during difficult lighting conditions; post processing cannot correct when light conditions exceed latitude of CCD
- Remember the camera's exposure is based on 18% gray



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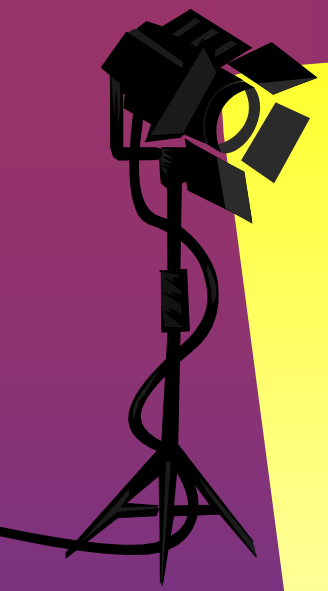
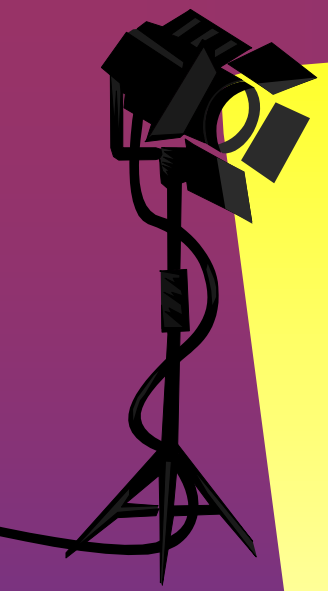


WHY IS LATITUDE & COLOR PALETTE IMPORTANT????

- Contrary to popular belief, image editing software (i.e. Photoshop) cannot fix any image; some images cannot be fixed!
- Garbage in = garbage out
- Examples:
  - Image too dark
  - image too light
  - color balance is off; image has a distinct color tint
- A technically “sound” image makes it easier to achieve a “good” picture

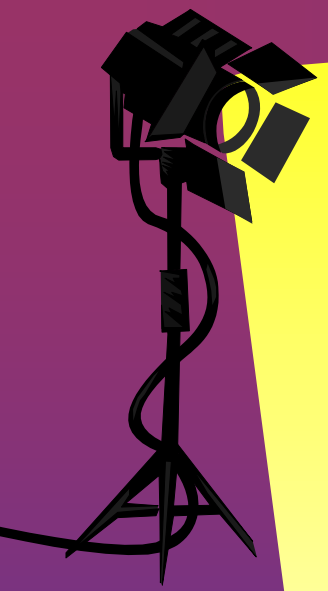


Summary

- The basics of photography are the same; good images requires an understand of the technical characteristics of the digital medium
- Digital image manipulation is the equivalent of the film darkroom; its helps but it is NOT MAGIC!
- It always helps to have to have a technically good image to start with
- Strive to get as good an image as possible to start with

TIPS

- Read, understand, and know the camera manual!
- Get & read a book on the basics of photography
- Understand our camera's color palette
- Experiment with exposure and ISO settings
- Try various formats and image sizes
- Use compression carefully
- The web is a good source of information
- Take lots of pictures; practice, practice, practice; but remember perfect practice that makes perfect!
- ***Take pictures as if image editing software does not exist!***



Contact Information

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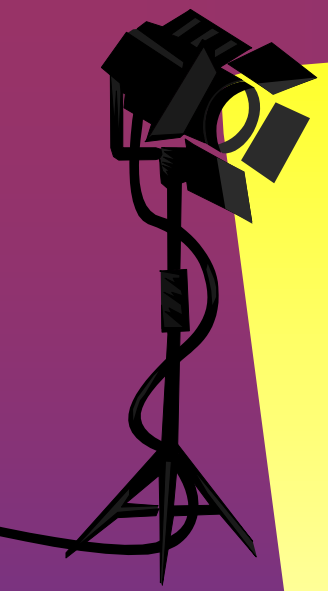
703-830-6860



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