

# High Dynamic Range Imaging

Increasing the contrast budget  
or ...

HDR is really LDR, but ...

David Warren, January 2010

# Presentation Outline

1. Re-juggling image tone and contrast
2. Dynamic range of various sensing devices
3. How can you use available dynamic range
4. Capturing images for HDR
5. HDR post-process workflow
6. Processing images: tone mapping, exposure blending, pseudo-HDR
7. Sample images
8. HDR software options
9. Some other tools for redistributing contrast
10. The easiest way: HDR in camera
11. Some HDRI-related websites
12. Some HDRI-related books

# Re-juggling image tone & contrast

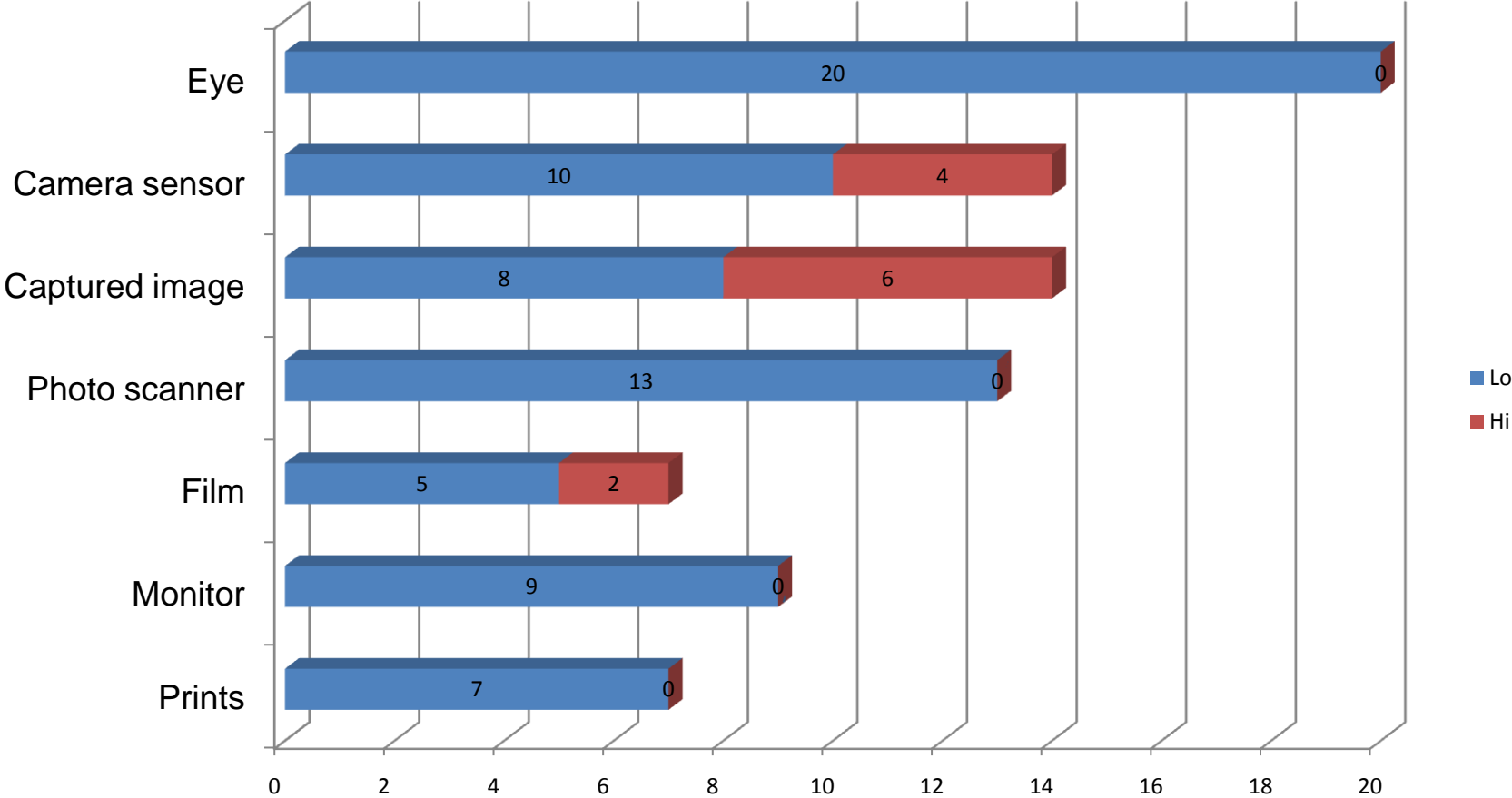
- Concepts from previous DISG white papers
  - Dynamic range (Ken Hales)
  - Dynamic range redux (David Warren)
  - Photomatix for HDR: First look (David Warren)
  - Managing the contrast budget
- Ways to expand the contrast budget
  - Reduce global, increase local contrast
  - Blend exposures
  - High dynamic range imaging

# Dynamic range of devices

Human eye 1,000,000:1	Depends on adaptation, which may take time
Camera sensor Up to 8,000:1 (13 EV)	Depends on the camera (Some examples on next slide)
Captured images 256:1 to 16,000:1	JPG 8 EV = 256:1 RAW 12-14 EV => 16,000:1
Photo scanner 8,000:1	At a $D_{\max}$ of 4 (All scanners seem to claim that, but who knows?)
Film Print 128:1, Slide 50:1	And those were the good old days?
Monitor < 1,000:1	LCD monitor is about 9.5 EV There are HDR monitors priced at around \$50K
Inkjet printer Not a clear answer	Have read that paper is 6-8 EV, but ...

# Dynamic range of devices

In EV (logarithmic scale)



# How to use more of the available DR from your camera

- Tone down highlights and bring up shadows
  - Highlights/shadows
- Increase microcontrast
  - Various filters; will summarize later
- If you can get the result you want without resorting to HDR, do it

# Dynamic range of some sensors

Nikon D3X 13.7

Nikon D300 12

Nikon D200 11.5

Nikon D80 11.2

Canon 1Ds 12

Canon 40D 11.3

Canon 5D 11.1

Panasonic G1 10.3

# Capturing images for HDR, Part 1

## Three alternatives

- True HDR and tone mapping
  - Autoexposure bracketing at 0, -2, and +2 EV
  - Manual exposures for more than ±2 EV
  - Convert to a 32-bit image and tone map
- Blending two or more exposures w/o HDR
  - Masked layers in Photoshop
  - “Exposure fusion” in Photomatix (much easier)
- Making pseudo-HDR from a single RAW image

## Capturing images for HDR, Part 2

# How many exposures do you need?

- Maybe one, if the contrast isn't too high
- Three are enough in many cases
- For more than three, use spot metering and manual exposure mode
- Histogram in live view helps
- “Blinkies” method (Ben Willmore)
  - Willmore sells a tutorial DVD for \$79

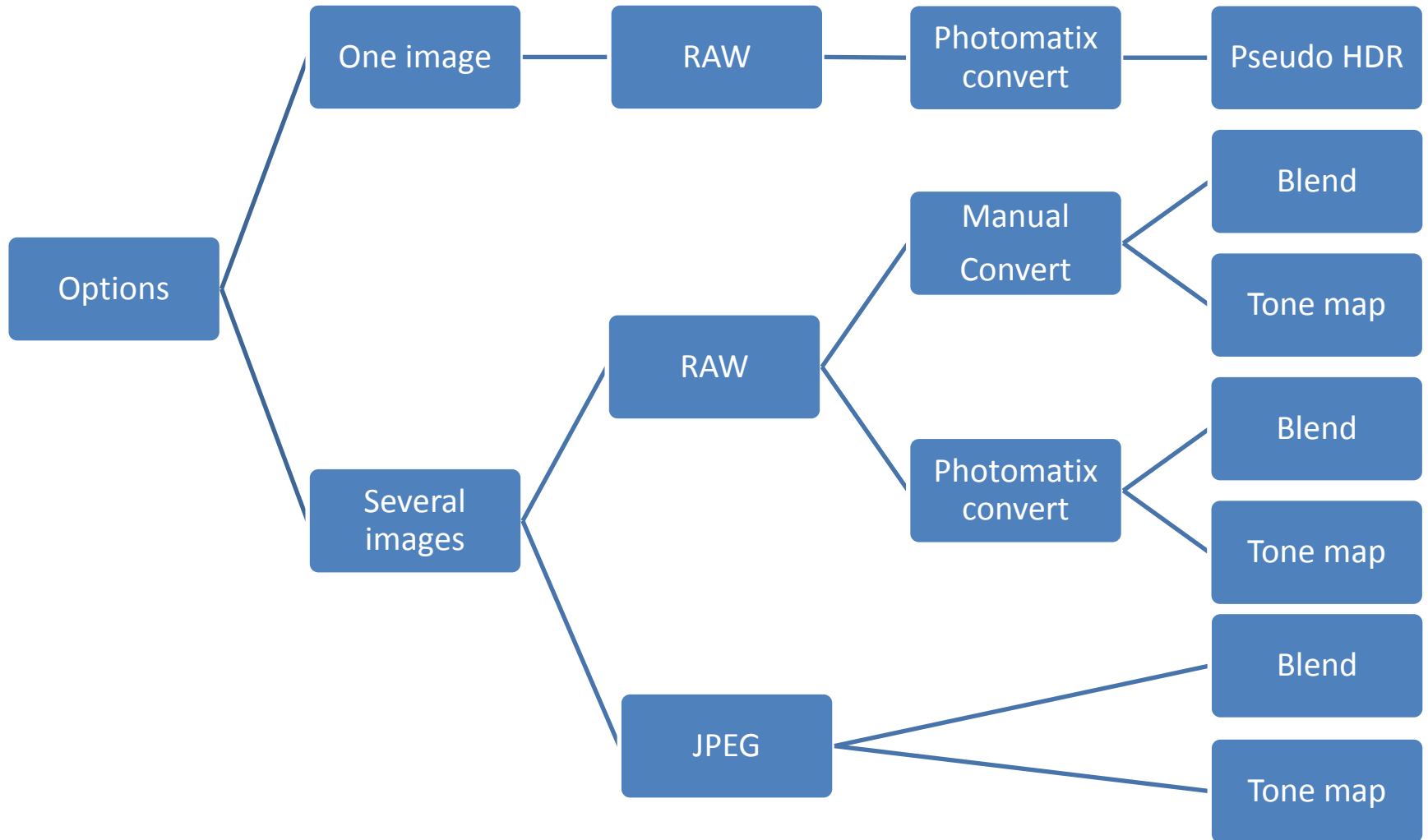
# Capturing images for HDR, Part 3

## Camera settings and tips

- Moving subjects ruin the day for HDR
- Use autoexposure bracketing if you can
- With AEB use Av – why?
- Use fixed (not auto) ISO, as low as possible
- Consider using JPEG (RAW complicates workflow)
- Use a tripod (unless you like to live dangerously)

# Photomatix HDR Workflow, Part 1

## Options



# Photomatix HDR Workflow, Part 2

## Tone Mapping HDR to LDR

- An HDR (32-bit, radiance) image cannot be viewed on available devices
  - Tone mapping algorithms reduce HDR to LDR to make it viewable
- What is tone mapping?
  - It preserves contrast between neighboring regions rather than absolute value of contrast and brightness
  - It is like human perception, which responds to contrast more than to absolute intensity
  - It preserves or enhances local contrast at the cost of flattening overall image contrast.
- General opinion is that Photoshop tone mapping doesn't work well. That's my opinion, too. But by all means, try it.

# Photomatix HDR Workflow, Part 3

## Exposure blending

- Manual
  - Stack differently-exposed images and mask the layers
  - Think of it as manual tone-mapping if you like
- Photomatix (called “Exposure Fusion”)
  - More realistic look than tone mapping.
  - Even if you use Photomatix, you may end up masking in corrections for problem areas

# Photomatix HDR Workflow, Part 4

## Pseudo-HDR

- Use a single image
  - Imagine “developing” a single RAW image 3 times
    - Different exposures (0, +2, -2) in ACR
    - Then apply regular HDR process
  - No need to, tho; Photomatix will do it for you
  - Clearly not as much dynamic range as 3 separate exposures
    - If your camera does 11 EV, then 3 images  $\Rightarrow$  15 EV
  - But it may be enough

**SAMPLE IMAGES:  
DELETED FROM WEB VERSION**

# HDR software options

(Site with limited comparisons available)

Photomatix Pro	Free trial version	\$99-\$119
Radiance		Free
Hypershot		\$50
CinePaint	Open Source	Free
Unified Color HDR Studio		\$150
SilverFast HDR / Studio	This must be special!	\$295-\$930
Hugin	Open Source	Free
Dynamic Photo HDR	Free trial available	\$55
FDR Tools	Basic version free	\$85
Luminance HDR		Free

# Some other tools for redistributing contrast

PS Shadows/Highlights	You already have it
Light Machine	Plugin Site; for performing all kinds of light adjustments in photos; \$70
Contrast Master	Plugin Site; for effective contrast enhancement as well as creating dramatic contrast looks, photorealistic paintings and HDR-like effects \$70
Topaz Adjust	Topaz Labs; applies creative color, detail, and exposure to images in unique ways; \$50
ReDynaMix HDR	DCETools; easily create images with vivid effects; \$16
Nik ColorEfex Pro	Nik Software; 52 filters and over 250 effects for retouching, color correction and creative enhancements; \$300 complete
Nik Viveza	Nik Software; precision-targeted brightness, contrast, and color adjustments; \$200

# The easiest way: Right in the camera

- Pentax K-7
  - 3 exposures capture 17 EV range
  - Tone mapping in camera takes 10-12 seconds
  - Result is a single tone-mapped HDRI image
  - Article available from Adorama
  - Body price tag: about \$1,050
  - The more recent K-x too, about \$650
- Which company will be next?

# Some HDRI-related books

- Howard, *Practical HDRI*
  - Haven't seen it, but I've seen high recommendations
- Bloch, *The HDRI Handbook*
  - Extensive, but oriented in part to cinematic HDRI
- Gulbins & Gulbins, *Photographic Multishot Techniques*
  - Covers HDRI, stitching, focus stacking and super-resolution
- Correll, *High Dynamic Range Digital Photography for Dummies*
  - Are they kidding?

# A very few HDRI-related websites

- Cambridge in Colour--an excellent resource with excellent tutorials
- Take a look at the flickr.com HDR Pool
- HDRcreme has scads of Wow! images, including many of the surrealist & grunge type