"RAW" Conversion Options
Too Much of a Good Thing?

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RAW" Conversion Options
Too Much of a Good Thing?

- 2007- 2009 Growth in options
- Making sense of the options
  - How to evaluate them
    - Colour balance
    - Tone scale
    - Colour reproduction
- Recommendations
### 2007-2009 Growth in Options

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th></th>
<th>2009</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D200</strong></td>
<td><strong>NX 1.2</strong></td>
<td><strong>CS3</strong></td>
<td><strong>D300</strong></td>
<td><strong>NX 2.2</strong></td>
</tr>
<tr>
<td>Mode I</td>
<td>Mode I</td>
<td>ACR 3.3</td>
<td>Standard</td>
<td>Standard</td>
</tr>
<tr>
<td>Mode II</td>
<td>Mode II</td>
<td>Neutral</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td>Mode III</td>
<td>Mode III</td>
<td>Portrait</td>
<td>Portrait</td>
<td>Portrait</td>
</tr>
<tr>
<td>Mode Ia</td>
<td>Mode Ia</td>
<td>Vivid</td>
<td>Vivid</td>
<td>Vivid</td>
</tr>
<tr>
<td>Mode IIIa</td>
<td>Mode IIIa</td>
<td>Landscape</td>
<td>Landscape</td>
<td>Landscape</td>
</tr>
<tr>
<td><strong>Total 3</strong></td>
<td><strong>Total 5</strong></td>
<td><strong>Total 3</strong></td>
<td><strong>Total 8</strong></td>
<td><strong>Total 8</strong></td>
</tr>
</tbody>
</table>

* Downloadable optional extra profiles
Understanding The Options

- How can we make sense of all these options?
  - Do a structured test
  - Use the Macbeth Color Checker Chart
  - Evaluate results

- Compare
  - D300 (Camera)
  - Nikon NX 2.2.0 Software
  - Adobe Photoshop CS4 – ACR 5.3
### Colour & Tone Scale

**Macbeth Color Checker**

<table>
<thead>
<tr>
<th>Dark Skin</th>
<th>Light Skin</th>
<th>Blue Sky</th>
<th>Foliage</th>
<th>Purplish Blue</th>
<th>Bluish Green</th>
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</thead>
<tbody>
<tr>
<td>Orange</td>
<td>Purplish</td>
<td>Moderate</td>
<td>Purple</td>
<td>Yellow Green</td>
<td>Orange Yellow</td>
</tr>
<tr>
<td>Blue</td>
<td>Green</td>
<td>Red</td>
<td>Yellow</td>
<td>Magenta</td>
<td>Cyan</td>
</tr>
<tr>
<td>White</td>
<td>Neutral 8</td>
<td>Neutral 6.5</td>
<td>Neutral 5</td>
<td>Neutral 3.5</td>
<td>Black</td>
</tr>
</tbody>
</table>
Colour & Tone Scale – Exposures

- The Macbeth Color Checker test chart was photographed with a Nikon D300 camera
  - RAW & High Quality JPEG @ ISO 200
  - Custom White Balance
  - Adobe 1998 colour space
  - All 8 “looks” selected

  - Standard
  - Neutral
  - Portrait
  - Vivid
  - Landscape
  - D2X Mode I
  - D2X Mode II
  - D2X Mode III
Image Generation – Nikon NX Software

- All 8 raw files were opened and saved as 8 bit R, G, B, TIF files
- Embedded colour profiles used
- All conversion settings were set to “default”
- Appropriate “looks/profiles” are selected automatically as NX “reads” the metadata and chooses the selected Picture Control Option

![Picture Control]

- [LS] Landscape
- Unchanged
Image Generation – Adobe Photoshop CS4

- All 8 raw files were opened and saved as 8 bit R, G, B, TIF files
- Adobe 1998 colour space used
- All conversion settings were set to “default”
- Appropriate “looks/profiles” were selected manually as CS4 does not “read” the relevant Picture Control metadata
Data Analysis

- TIFS and JPEGS opened using Photoshop CS4 Extended
- Macros were run
  - To collect R, G, B code values from individual Macbeth patches
  - Convert R, G, B code values to L* a* b* (Lightness, R-G, Y-B)
  - Compare the L* a* b* values of the data from the image files with the reference values of the Macbeth Chart
  - Calculate CIE 2000 colour differences
- Data plotted
  - Colour Balance
  - Lightness
  - Colour Accuracy
  - Colour Saturation
Colour Balance vs. Code Value

Colour Balance Change vs. Code Value

\[ a^*/b^* \text{ change} \]

\[ \text{R, G, B Code Value Changes} \]
Colour Balance - 2 a*/b* shift
Colour Balance - D300 JPEGs

- Green
- Blue
- Red a*
- Yellow b*

Legend:
- Camera Std
- D2X Mode 1
- D2X Mode 2
- D2X Mode 3
- Landscape
- Neutral
- Portrait
- Vivid
Colour Balance – NX TIFS

- Green
- Blue
- Yellow b*
- Red a*

Legend:
- Camera Std
- D2X Mode 1
- D2X Mode 2
- D2X Mode 3
- Landscape
- Neutral
- Portrait
- Vivid
Colour Balance – CS4 TIFS

![Diagram showing the Colour Balance graph with markers for different modes and settings. The graph includes axes for Blue, Green, Yellow b*, Red a*, and Blue. The markers represent various settings such as Camera Std, D2X Mode 1, D2X Mode 2, D2X Mode 3, Landscape, Neutral, Portrait, Vivid, ACR 4.3, ACR 4.4, and Adobe Standard.]
Tone Scale $L^\text{out}$ vs. $L^\text{in}$

Graph showing the output lightness ($L^\text{out}$) versus the input lightness ($L^\text{in}$) for different modes on a Nikon D300 camera. The modes include Camera Std, D2X Mode 1, D2X Mode 2, D2X Mode 3, Landscape, Neutral, Portrait, and Vivid.
Tone Scale $L^\text{out}$ vs. $L^\text{in}$

- Camera Std
- D2X Mode 1
- D2X Mode 2
- D2X Mode 3
- Landscape
- Neutral
- Portrait
- Vivid

Adobe CS4 – ACR 5.3
“Nikon Profiles”
Tone Scale L*out vs. L*in

Adobe CS4 – ACR 5.3
Nikon & Adobe “Profiles”
NX vs. D300 In Camera

![Graph showing Delta L* vs. L* in for various camera modes.](image)
CS4 vs. D300 In Camera

![Graph showing Delta L* vs. L* in for different camera settings including Camera Std, D2X Mode 1, D2X Mode 2, D2X Mode 3, Landscape, Neutral, Portrait, and Vivid.]
Camera Standard

Macbeth ColorChecker® Color Rendition Chart Chart

D300
Adobe Standard vs. Nikon Standard

Nikon NX

Adobe CS4
Adobe Standard vs. Nikon Standard
Maximum Colour Accuracy (Error)

Maximum DE200 c.f Camera

- DX2 Mode 1 CS4: 2.12
- Vivid CS4: 1.77
- Landscape CS4: 1.67
- DX2 Mode 2 CS4: 1.49
- Camera Std CS4: 1.30
- DX2 Mode 1 NX2: 1.21
- DX2 Mode 3 CS4: 1.15
- Neutral CS4: 1.10
- Portrait CS4: 0.99
- Vivid NX2: 0.96
- Neutral NX2: 0.68
- Camera Std NX2: 0.68
- DX2 Mode 2 NX2: 0.68
- DX2 Mode 3 NX2: 0.67
- Landscape NX2: 0.66
- Portrait NX2: 0.46

Graph showing the comparison of Maximum Colour Accuracy (Error) for different camera modes.
Colour Reproduction – Vivid

Adobe CS4
Tone Scale - Choices

- Camera vs. NX vs. CS4 – Tone Scale
  - Small differences in tone scale mainly confined to shadows where Adobe is trying to replicate in-camera performance
  - Big differences in preference between Nikon tone scales and Adobe tone scales (ACR 4.3/4.4 & Adobe Standard)

- Camera vs. NX vs. CS4 – Impact on Colour
  - Small differences in colour observed, influenced by tone scale differences
  - What about “real” colour preferences?
    - Nikon “looks” vs. Adobe “looks”
Overall Colour Accuracy (Error)
Overall Colour Saturation
Colour - Choices

◆ Nikon “looks”
  ■ Overall colour becomes less accurate as the colour saturation increases
  ■ Hue errors on average are small

◆ Adobe “looks”
  ■ Overall accuracy similar to mid saturation Nikon “looks” for ACR 4.3 & 4.4 profiles
  ■ Overall saturation similar to Nikon “camera standard”
  ■ Adobe Standard very different in terms of hue error compared to all other profiles
  ◆ Worth investigating further!!
Nikon D300 Standard
Adobe ACR 4.4
Nikon D300 Standard
Nikon D300 Standard
Adobe Standard??

- Average hue error Adobe Standard -2.27
- Can this error be reduced?
  - Try Adobe DNG Profile Editor
- Optimise using Macbeth Color Checker
  - Average hue error 0.55
  - Similar to other profiles!
- Does Adobe have a distinct preference for colour reproduction or is there a “bug” in ACR?
Conclusions

- Lots of choice!!!
- Similar to choosing a film!
- Adobe emulation of Nikon Profiles
  - Broadly similar in overall saturation and colour reproduction
  - Tone scale differences in shadows
  - Not a true match but ACR 5.3 has a similar “look” to Nikon
- Adobe Standard
  - Different preference to previous Adobe profiles
  - Different to Nikon profiles
  - Blues >> cyan
  - Reds >> magenta
  - Skin tones >> pinker
Final Thoughts/Recommendations

- Regard choosing a profile ("look") as the same as choosing a film
  - Depending upon scene content, lighting etc. choice of film may vary
  - Fuji Velvia not too good for portraits but may be great for certain landscapes
  - Kodak Portra 160 NC not too good for landscapes but great in the studio for portraits

- Get to know the "looks"
  - Explore the differences on a variety of scenes

- Simple life, can I just use one?
  - Yes of course, and tweak colour and contrast afterwards if you don’t like the results on certain scenes
CS4 - Adobe Standard
CS4 - Camera Standard
CS4 - Camera Vivid
CS4 - Camera Standard
CS4 - Camera Portrait
Thank You
Questions?