

Inkjet printing coming to age



by Uwe Steinmueller
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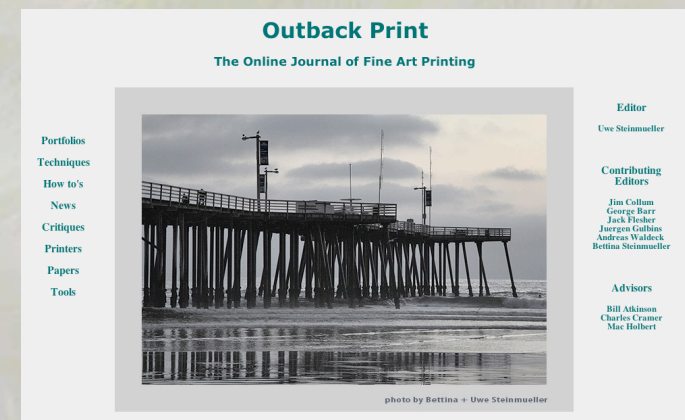
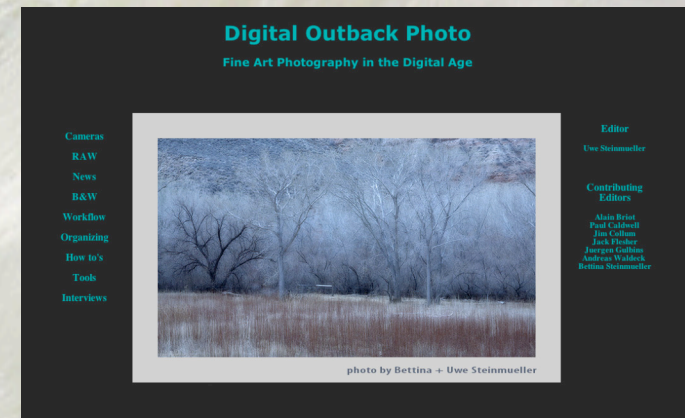
Program

- Intro
- Challenges
- Printers
- Inks
- Papers and Media
- Drivers and RIPs
- Editing
- Outlook
- Q&A (+ at any time)



Uwe Steinmueller is Editor/Owner of
www.outbackphoto.com
www.outbackprint.com

- Magazine about digital photography
- Digital SLRs and also MF backs
- Photographic Workflow E-books
- Fine Art Printing
- Photoshop techniques
- Workflow Technique
- News Groups
- Portfolios
- Industry News
- About 6 million visitors per year



Books

- E-Book on Printing
- www.outbackphoto.com



The Art of Digital Fine Art Printing

Using today's inkjet Printers for
Quality Prints



Uwe Steinmueller
Jürgen Gulbins

DOP3003

Printing is very easy



IF
everything works right

Requires luck, wishful thinking or experience

What needs to be right?

- Printer
- Ink
- Paper or Media
- Driver or RIP settings
- Color management (especially printer profiles)
- Image editing
- Print handling + presentation



All has to match!

- Printer
- Ink
- Paper or Media
- Driver or RIP settings
- Color management (especially printer profiles)

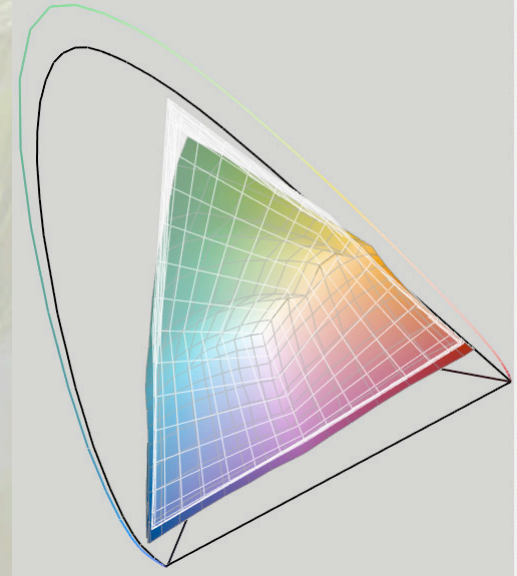


Printing Challenges

- Color Gamut
- dMax (maximum black density)
- Longevity
- Speed
- Resolution
- B&W output

Color Gamut

- Of different importance to photographers
- But of course an important printer parameter



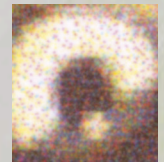
Longevity

- This is today an overriding criteria
- Strong influence on inks, papers, coatings
- WIR - Wilhelm Research

www.wilhelm-research.com		Category: 4x6-inch Printers	Updated July 3, 2005 (page 1 of 5)
WIR Display Permanence Ratings for Current Products in the 4x6-inch Photo Printer Category			
Type of 4x6-inch Dye-Sub Photo Printer, Inkjet Printer/Inkjet Paper, And Digital Silver-Halide Color Paper/Digital Minilab Photo Printer⁽¹⁾		<small>With v2.0 Endpoints at Both 1.0 and 0.6 Decades With Color-Match Measurement System and With Photo Framed Under Glass⁽²⁾</small>	
1. Epson PictureMate Personal Photo Lab (and new PictureMate Deluxe Viewer Edition)		104 years	
- Printed with Epson PictureMate Inks and Photo Paper (pigment-based inkjet prints)			
2. HP Photosmart 325, 335, 375, 385, 422, and 475 Compact Photo Printers		82 years⁽³⁾	
- Printed with HP Vivera Inks (HP 95, 97, 343, or 344 Tri-color cartridges) (dye-based inkjet prints)			
- With HP Premium Plus and HP Premium Photo Papers, High Gloss, Glossy, or Soft Gloss			
3. Canon Selphy D5700 Compact Photo Printer (dye-based inkjet prints)		41 years	
- Printed with Canon BCI-16 tri-color ink cartridge and Canon Photo Paper Pro PR-101			
4. Fujicolor Crystal Archive Type One Paper (silver-halide color prints)		40 years	
- Printed with Fuji Frontier 370 digital minilab and Fuji washless chemicals			
5. Kodak EasyShare Printer Dock, Plus, Series 3, and 5000 Printers (dye-sub prints)		26 years	
6. Dell Photo Printer 540 (dye-sub prints)		26 years	
7. Agfacolor Sensatis and Agfacolor Splendix Papers (silver-halide color prints)		22 years⁽⁴⁾	
- Printed with Agfa d-sub SuperSelect digital minilab and Agfa washless chemicals			
8. Kodak Edge Generations and Royal Generations Papers (silver-halide color prints)		19 years⁽⁵⁾	
- Printed with Norbau Q55-3011SM digital minilab and Kodak washless chemicals			
9. HP Photosmart 145 and 245 Compact Photo Printers (dye-based inkjet prints)		18 years	
- Printed using HP No. 57 Tri-color cartridge with HP Premium Plus and HP Premium Photo Papers, High Gloss, Glossy, or Soft Gloss			
- Printed with HP No. 57 Tri-color cartridge and Kodak Ultra-Picture Paper, High Gloss (Ultima ColorLast "Lasts Over 100 Years" version)		11 years⁽⁶⁾	
10. Konica Minolta OA Paper Impressa and Centuria For Digital (silver-halide color prints)		17 years⁽⁷⁾	
- Printed with Konica Minolta R2 Super 1000 digital minilab and Konica washless chemicals			
11. Lexmark SnapShot P315 Photo Jetprinter (dye-based inkjet prints)		16 years	
- Printed with Lexmark 35 or 36 color ink cartridges and Lexmark Premium Photo Paper			
12. Olympus P-10 Digital Photo Printer (dye-sub prints)		8 years	
13. Canon CP-200, CP-220, CP-330, CP-400, and CP500 Printers (dye-sub prints)		7 years	
14. Sony DPP-FP30 PictureStation Photo Printer (dye-sub prints)		6 years	
15. Sony DPP-EX5, DPP-EX7, and DPP-EX50 Printers (dye-sub prints)		4 years	
<small>©2005 by Wilhelm Imaging Research, Inc. As long as this document remains complete and unaltered, it may be freely distributed to your associates, customers, and friends. This PDF may also be reproduced in magazine articles, books, and other tertiary print publications; however, it may not be posted on websites without written permission. Links to <www.wilhelm-research.com> are welcome. Address e-mail inquiries to: <info@wilhelm-research.com> Wilhelm Imaging Research, Inc., P.O. Box 775, Ghent, Ohio 40116 U.S.A.</small>			
		... continues next page	
<small>This document originated at <www.wilhelm-research.com> File name: <WIR_4x6_Prints_2005_07_03.pdf></small>			

Resolution

- Today's top inkjet printers have quite excellent resolution at viewing distance
- Smoothness is always a challenge
- Most difficult are good B&W prints
- Viewing distance or using a loupe



Inks

- Inks are a billion \$ market
- Dye and pigment inks
- Inks are very expensive (big profits but also high development costs)
- 6, 8, 12 inks and counting



Dye Inks

- Much smaller particles (easier to handle by the printer)
- Excellent gamut possible
- But fade in open air because the particles are that small (larger surface for contaminants)
- Swellable media can compensate in some cases
- Hardly used in fine art prints today

Pigmented inks

- Much larger particles
- Higher longevity
- Somehow smaller gamut
- Can easier cause clogging
- Main inks for today's fine art printers
- Epson was first and kind of owned this market
- HP and Canon followed in 2006

Issues with Pigmented inks

- Metamerisms
- Gloss differential (paper gloss and ink gloss)
- Bronzing (ink sits on top of the paper)
- Gamut
- Matte Black and Photo Black (Epson and switching inks)

Printers 1



- Thermal and Piezo heads (Epson, HP, Canon)
- Consumer, A3 and large format printers
- Precision and DPI
- Calibration (ink limits, linearization, factory or user)
- Profiling (later)

Printers 2



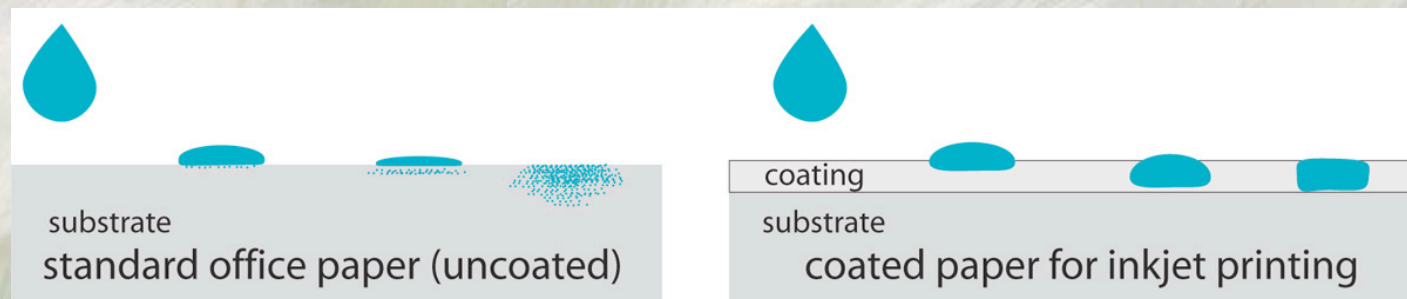
- Feeding (single sheet, roll, thick papers)
- Nozzle clogging
- Automatic/manual nozzle checks (ink waste)
- Banding

Paper and other media

- Endless variety of papers
- Matte, fine art, satin and glossy
- RC papers (plastic look, high dMax)
- Wood pulp or cotton rag (expensive and beautiful, lower dMax)
- Printing on other media: Textile, Metal and more

Paper and Coating

- Paper needs to be coated for high quality prints



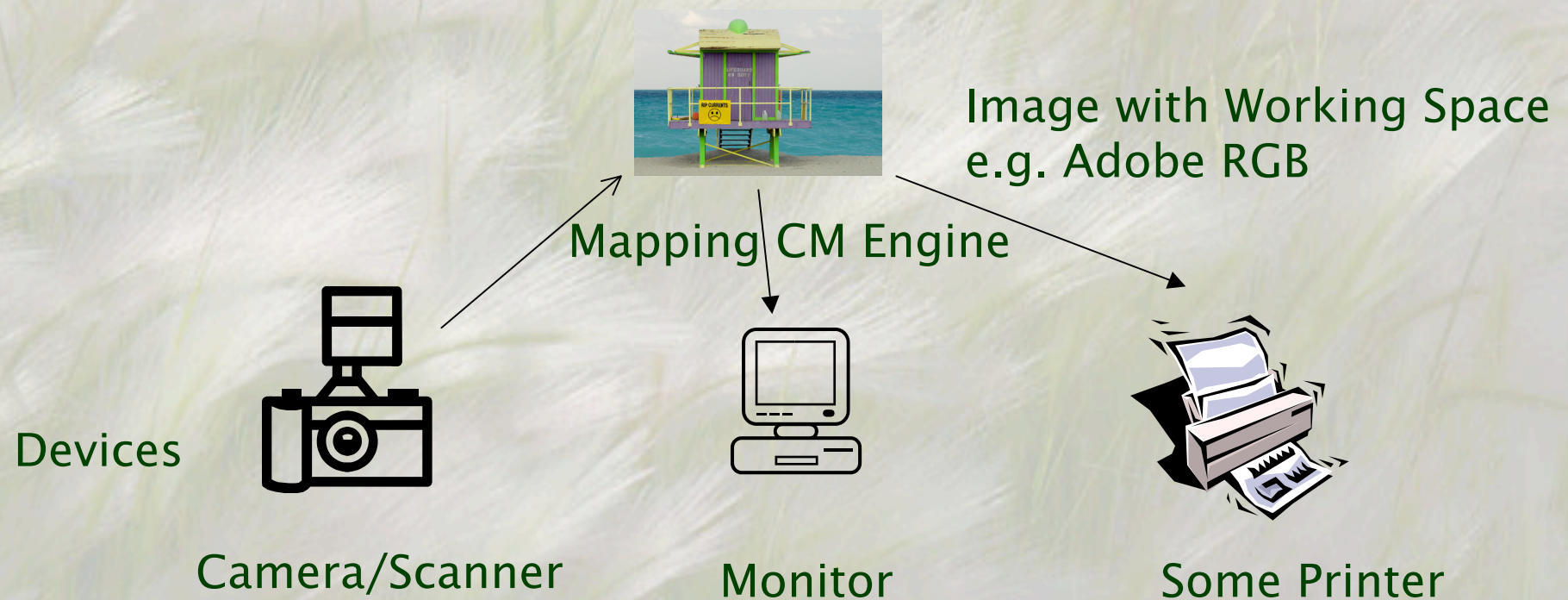
Issues with papers

- OBAs (Optical Brighteners Agents)
- Pigmented prints on glossy media
- Cotton dust
- Scuffing
- Outgassing (paper needs to dry for multiple days)
- Paper manufacturers quality control
 - Batch to batch differences

Color Management

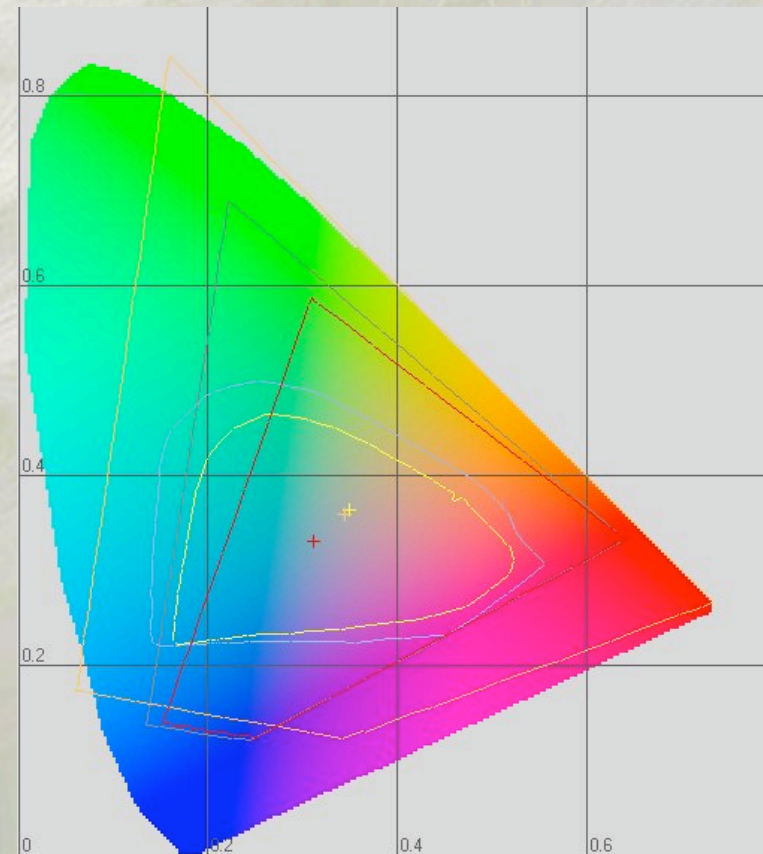
- A RGB value does not define an absolute color!
- Color management is complex
 - No reason not to do the best you can!
- Color Spaces (abstract and concrete)
 - A concrete color space (defined by a profile) describes an individual device
 - RGB + Color Space define an absolute color
 - Abstract (working space, non device) Color Spaces provide a standard reference point
 - Always tag you image files with an working space

Color Space Mappings



Color Gamut

- Is actually a 3D space

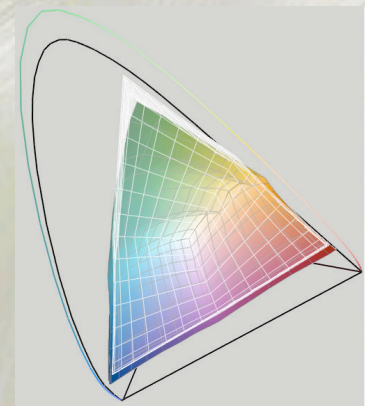


Soft-proofing

- Goal: see as close as possible what the print will look like
- Can never be perfect: e.g. Monitor never looks like a fine art paper or canvas

Printer profiles

- A printer profile is exactly for a single:
 - Printer
 - Paper
 - Ink
 - Printer calibration
 - Driver
 - Driver settings
 - Viewing light



Combination

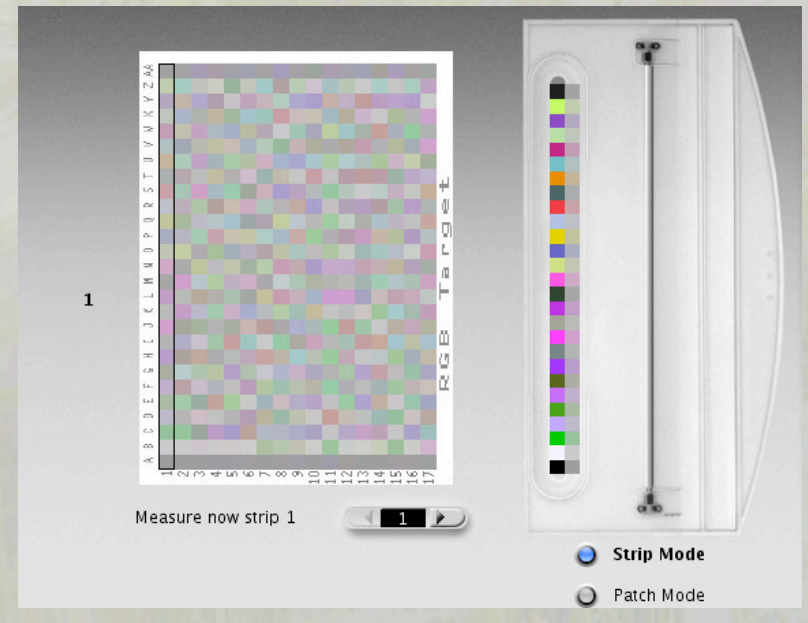
- Again: All has to match!

Printer profiles 2

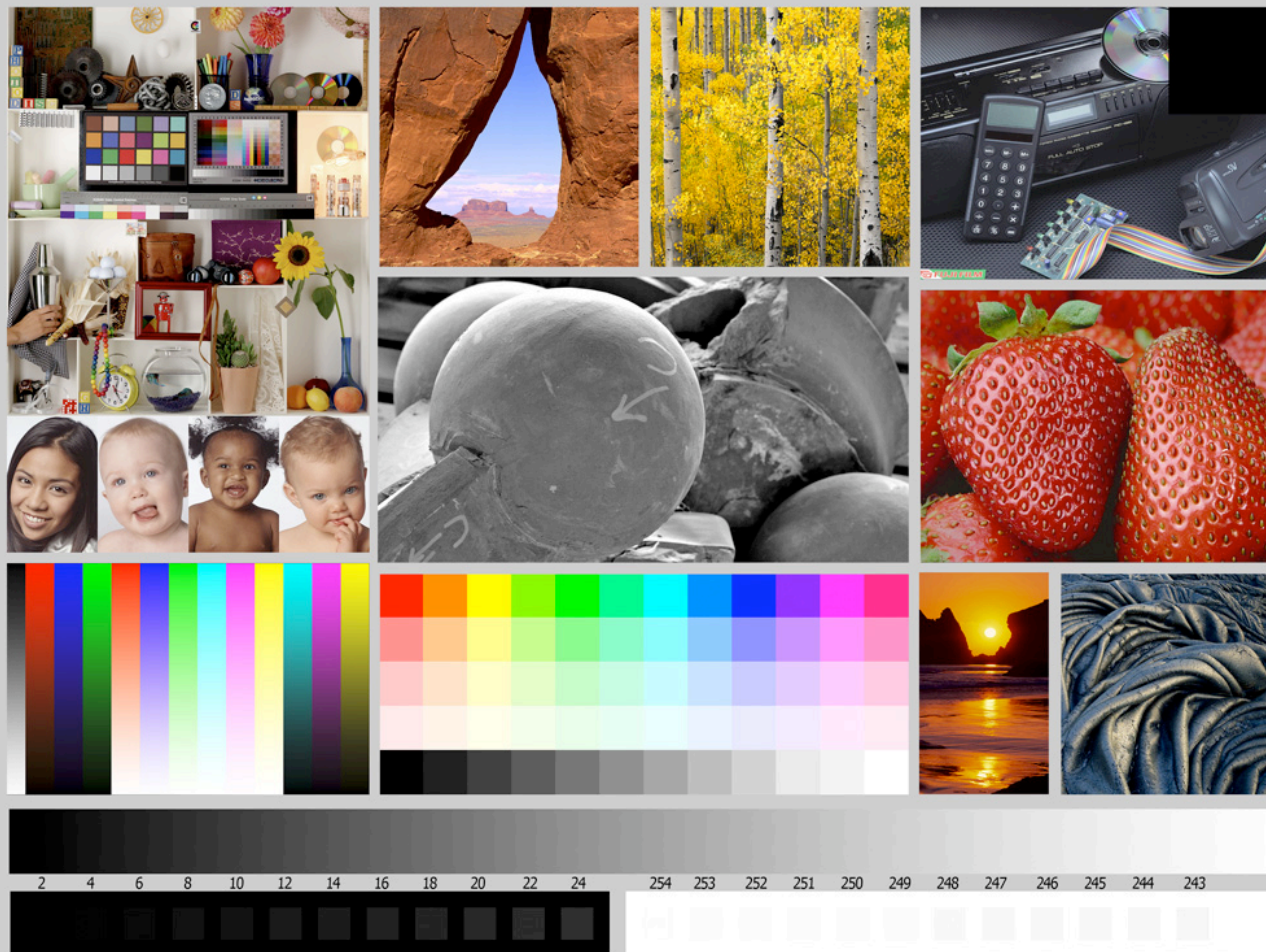
- Poor prints are more often than not the result of not optimal profiles
- Issue to watch for
 - Saturated colors
 - Neutrality
 - Rendering intent
 - Tone Curve (detail)
 - Viewing light

Creating Printer profiles

- Requires a Spectrophotometer (e.g. Eye-One)
- Some printers have a built-in Spectro (HP Z3100)



Printer Test images



Printing B&W

- Get more and more popular
- Requires at least 2-4 black/gray inks
- Has to match the very high standards of traditional darkroom work (but is different)
- Shadows and Highlights
- dMax
- Surface
- Color management for B&W
- RIPs

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photo by Bettina + Uwe Steinmueller

Printing Software

- Drivers
- RIP (Raster Image Processors)
- Printing host applications (e.g. Photoshop and Lightroom)

Drivers

- Have to handle complex tasks
 - Many settings (head height, drying time, speed, ink limits, ...)
 - Detail (upsizing)
 - Dithering (convert pixels to dots)
 - Color mapping
 - With 12 colors many combinations can produce the same color
 - Often making tones from more light colored dots than fewer dark colored ones
 - Drivers improve all the time
 - Special B&W modes are now common

Printing host applications

- These applications use drivers
- 16/8 bit
- New: Printer plugins (Canon and HP)
- Often an error prone process:
 - Printer selection
 - Paper size
 - Application print dialog
 - Printer driver dialog
 - Did I say it has to match :-)

Post processing of prints

- Drying
- De-curling
- Mounting (thick papers may not need this)
- Spraying (health hazard)
- Matting



RIPs

- Can improve printing quality compared to drivers
- Higher productivity
- Better linearization
- Can be more work
- Not cheap

Photo Editing

- The main step is preparing for the print (Photoshop, LightZone, ...)
- Dodge & Burn in the digital age (“Light”room)
- Fine tuning is all based on selective editing
- Here is spent most of the real work

Q&A

- All your questions belong here