International Color Consortium

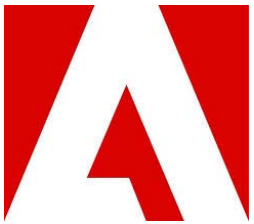
Validating the black point compensation standardization

Graphic Arts Color Experts' Day / June 2013

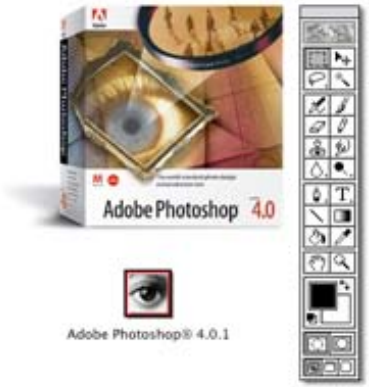
Marti Maria, Hewlett-Packard

Black Point Compensation becomes a standard

Q: Who invented black point compensation?

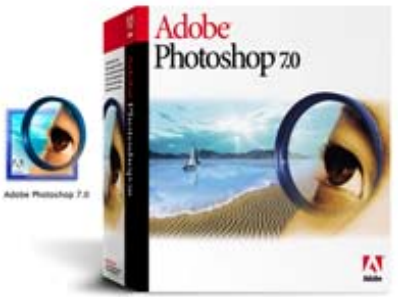


Adobe Photoshop™ 3.0

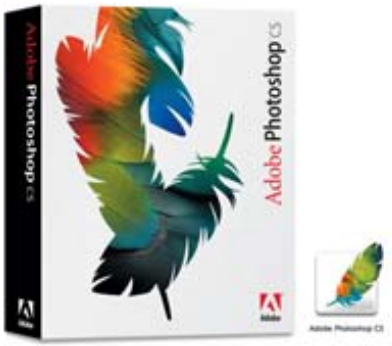


Adobe Photoshop® 4.0.1

Adobe® Photoshop® 5.0



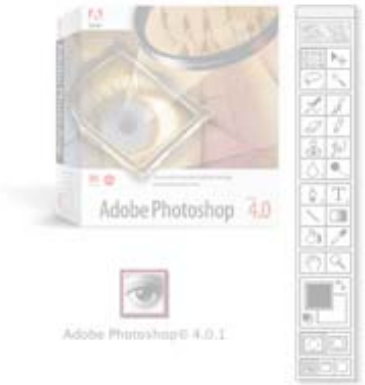
Adobe Photoshop 7.0



Adobe Photoshop CS

Adobe Photoshop CS3

Adobe Photoshop 3.0


Adobe Photoshop 4.0

Adobe Photoshop 5.0

Adobe
Photoshop 7.0

Adobe Photoshop CS

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ADOBE PHOTOSHOP CS3 EXTENDED
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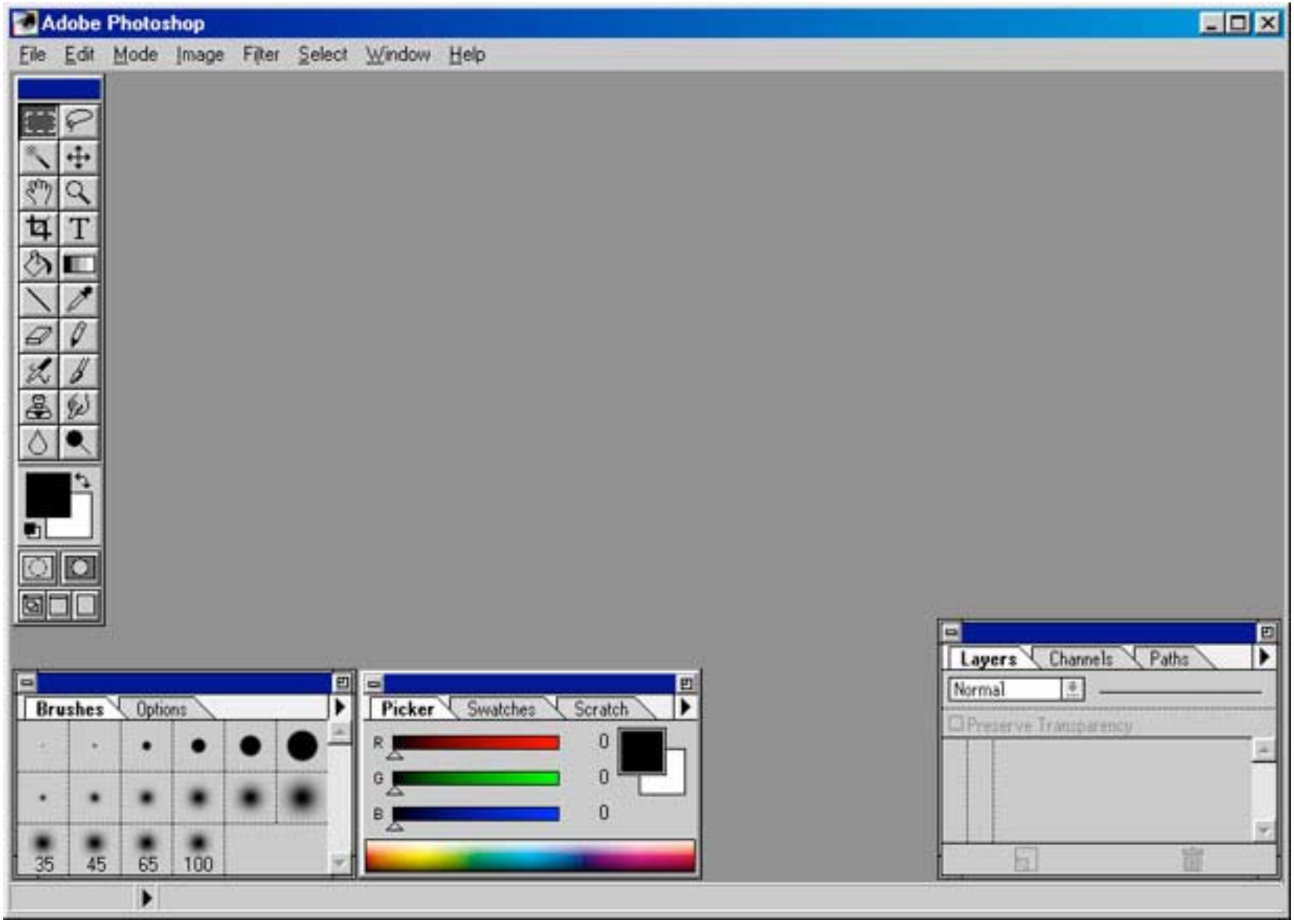

Adobe Photoshop
File Edit Mode Image Filter Select Window Help
Brushes Options
35 45 65 100
Picker Swatches Scratch
R 0
G 0
B 0
Layers Channels Paths
Normal
Preserve Transparency

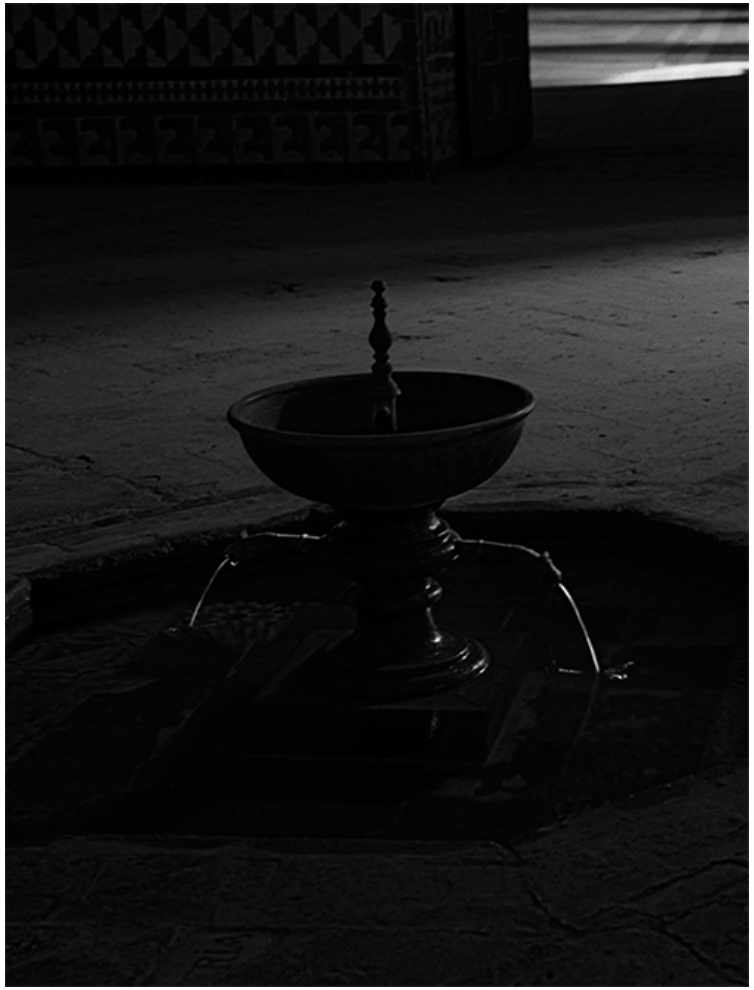
Timeline

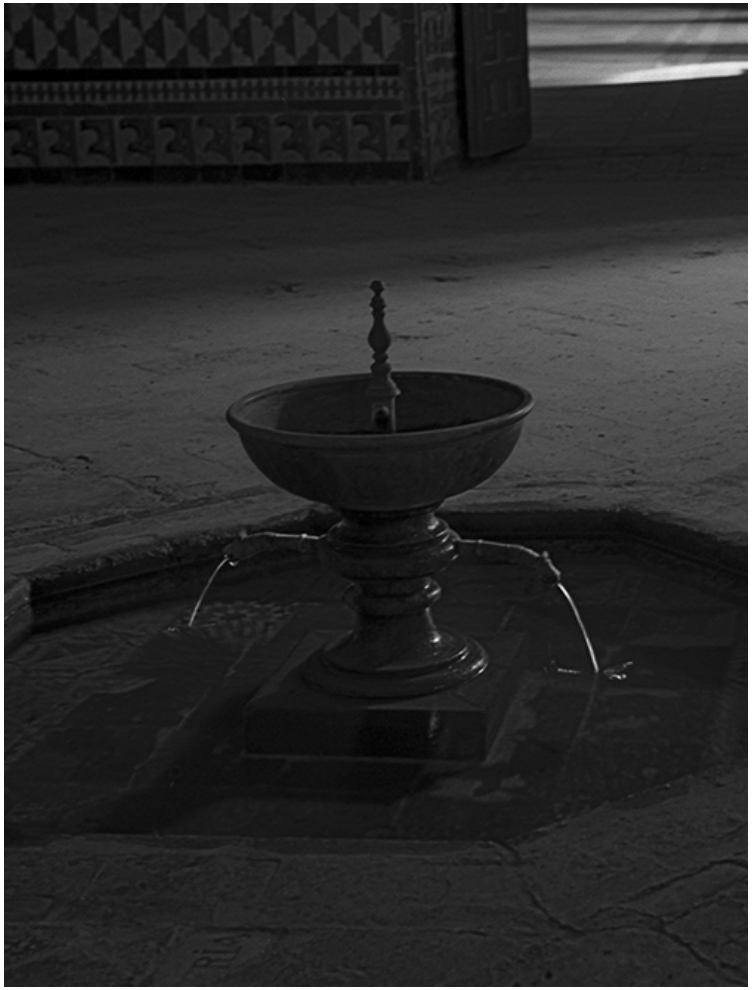
Photoshop 5.0 - 1998

Adobe Makes BPC algorithm available 2005/2006

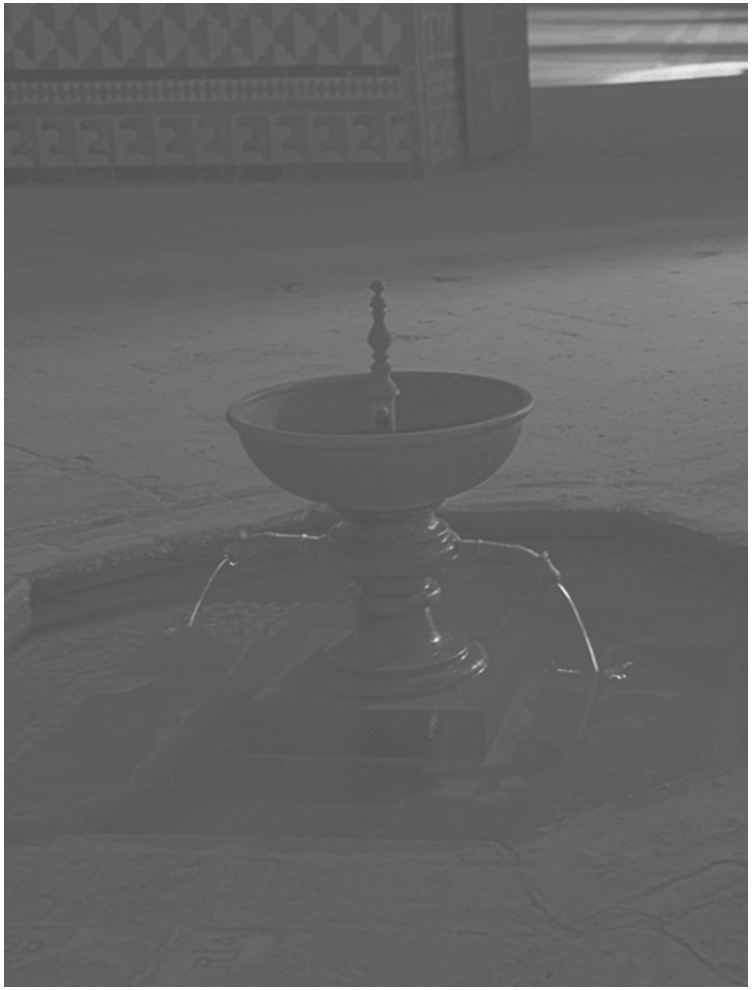
ICC/ISO TC130 to create a document to standarize the algorithm - 2013

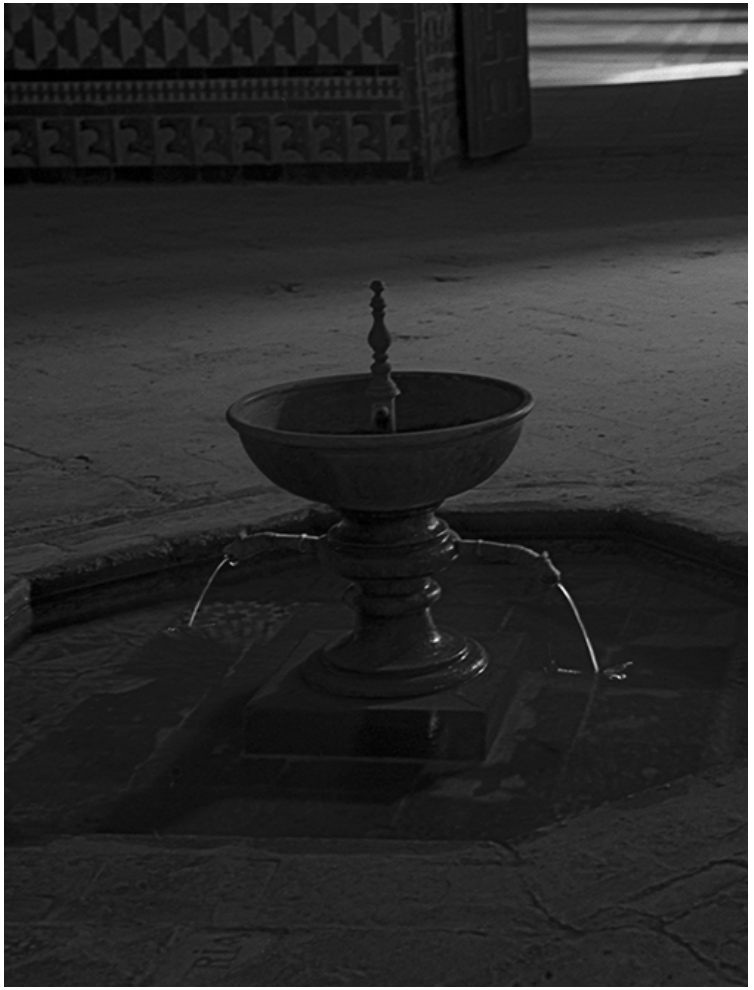
Black point compensation: what does

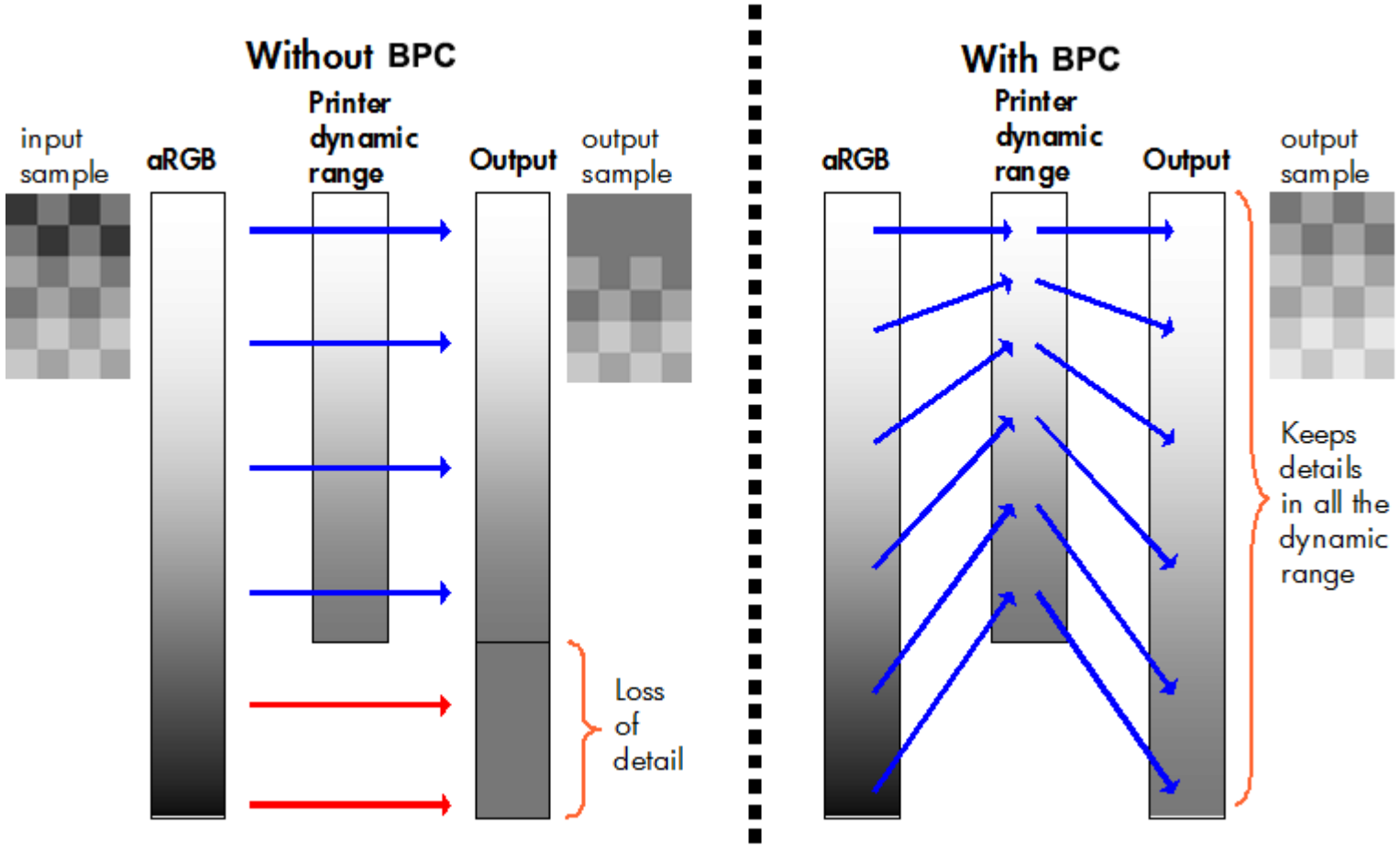


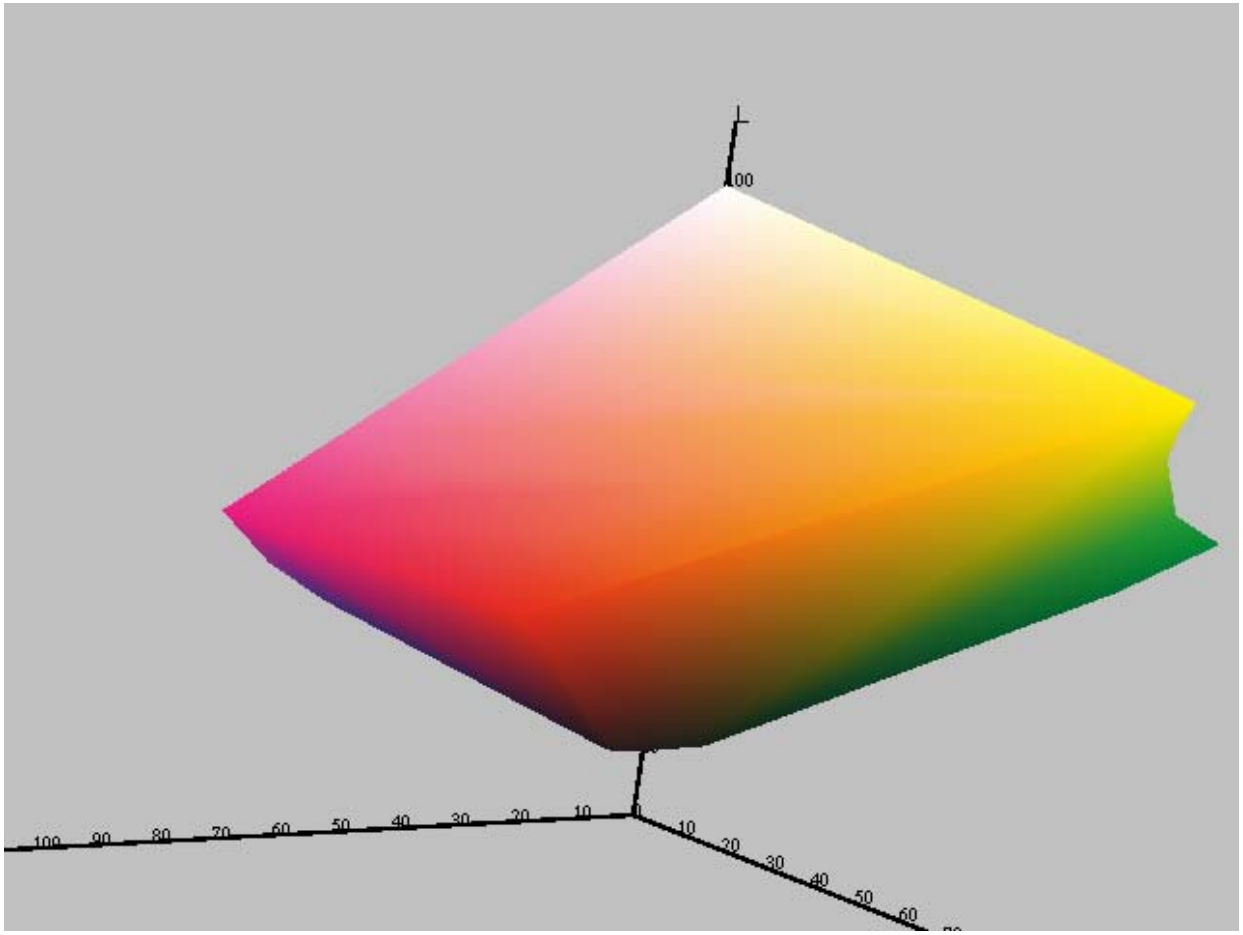


Black point compensation: what does






Without BPC
input sample
aRGB
Printer dynamic range
Output
output sample
Loss of detail
With BPC
aRGB
Printer dynamic range
Output
output sample
Keeps details in all the dynamic range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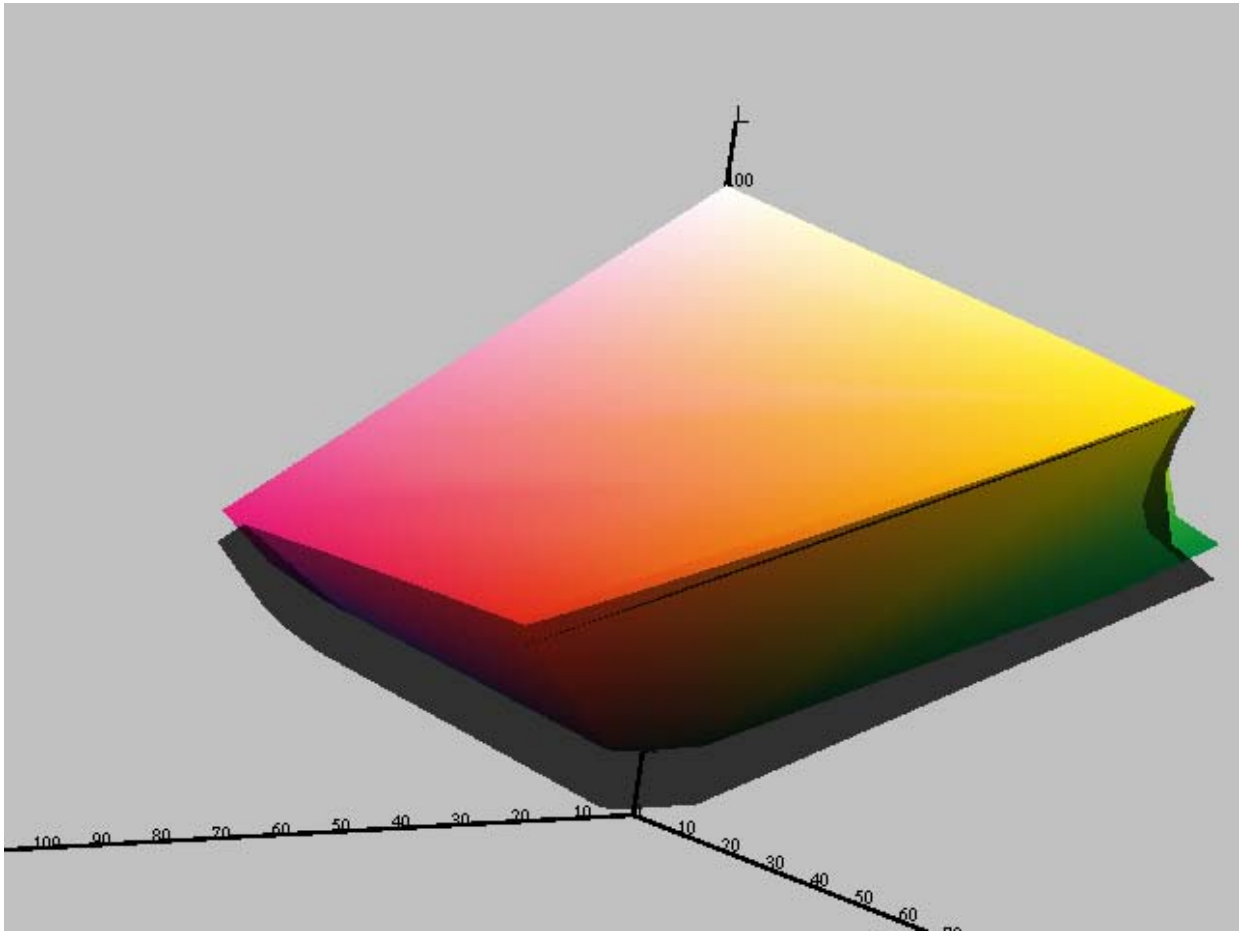
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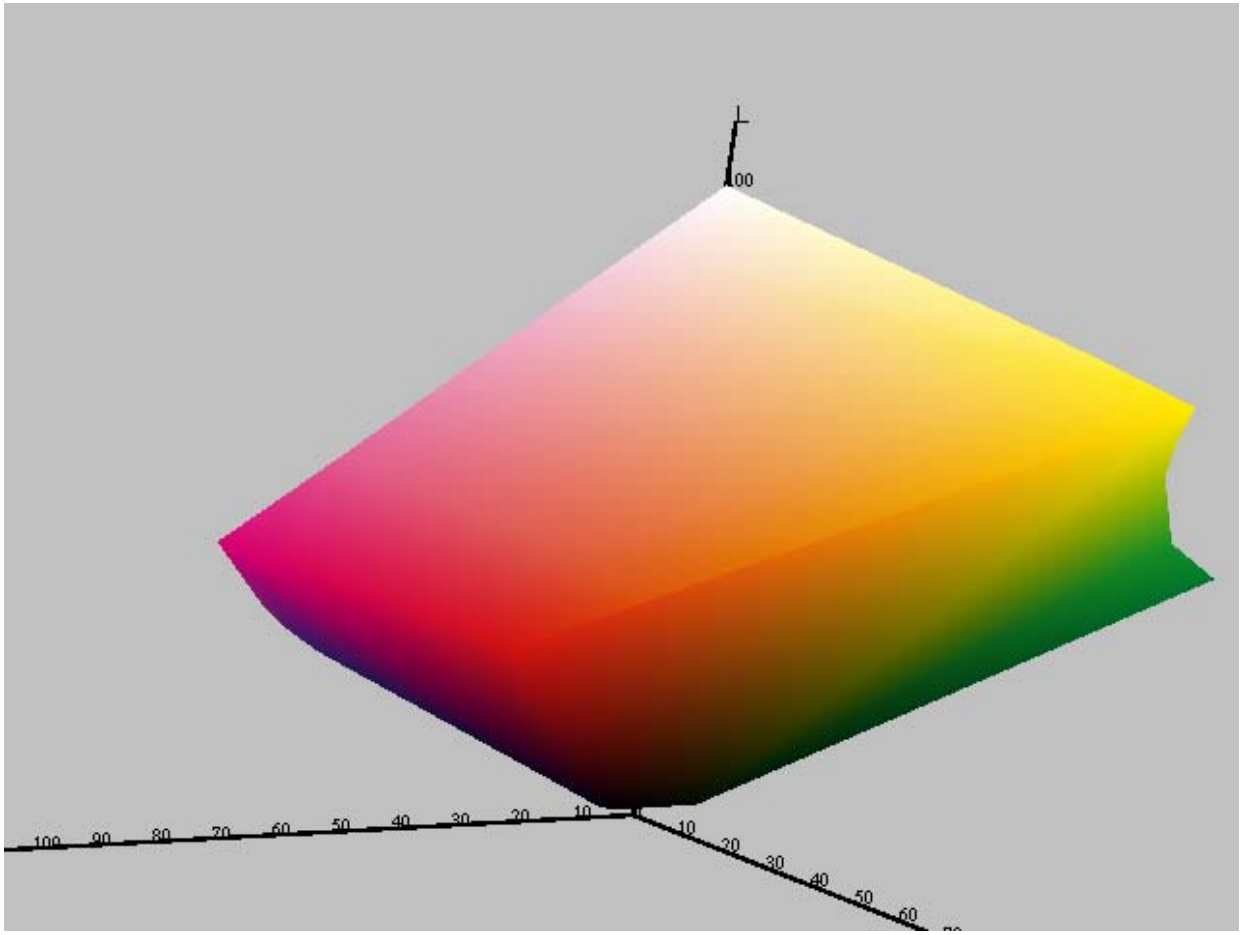
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Black point compensation: How it works

$$X_o = a_x * X_i + b_x$$

$$Y_o = a_y * Y_i + b_y$$

$$Z_o = a_z * Z_i + b_z$$

$$0.96 = a_x * 0.96 + b_x$$

$$1.00 = a_y * 1.00 + b_y$$

$$0.82 = a_z * 0.82 + b_z$$

$$X_{black_dest} = a_x * X_{black_src} + b_x$$

$$Y_{black_dest} = a_y * Y_{black_src} + b_y$$

$$Z_{black_dest} = a_z * Z_{black_src} + b_z$$

Black point compensation: What makes it so difficult?

$$X_{black_dest} = a_x * X_{black_src} + b_x$$

$$Y_{black_dest} = a_y * Y_{black_src} + b_y$$

$$Z_{black_dest} = a_z * Z_{black_src} + b_z$$

DETECTION OF BLACK POINTS

Test implementation done by HP

- Using just the BPC paper
- Based on the lcms framework
- Checked against 238 ICC profiles

Test implementation done by HP

Why?

- To check robustness of the algorithm.
- To check consistency with the Adobe color engine

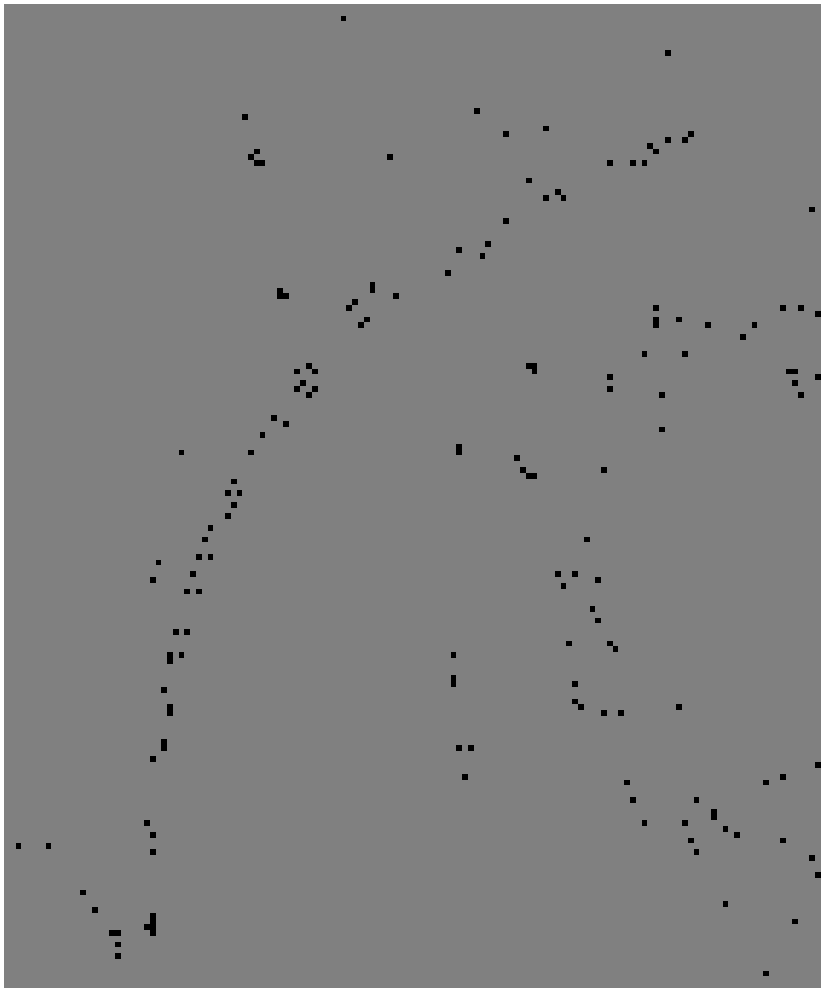
How?

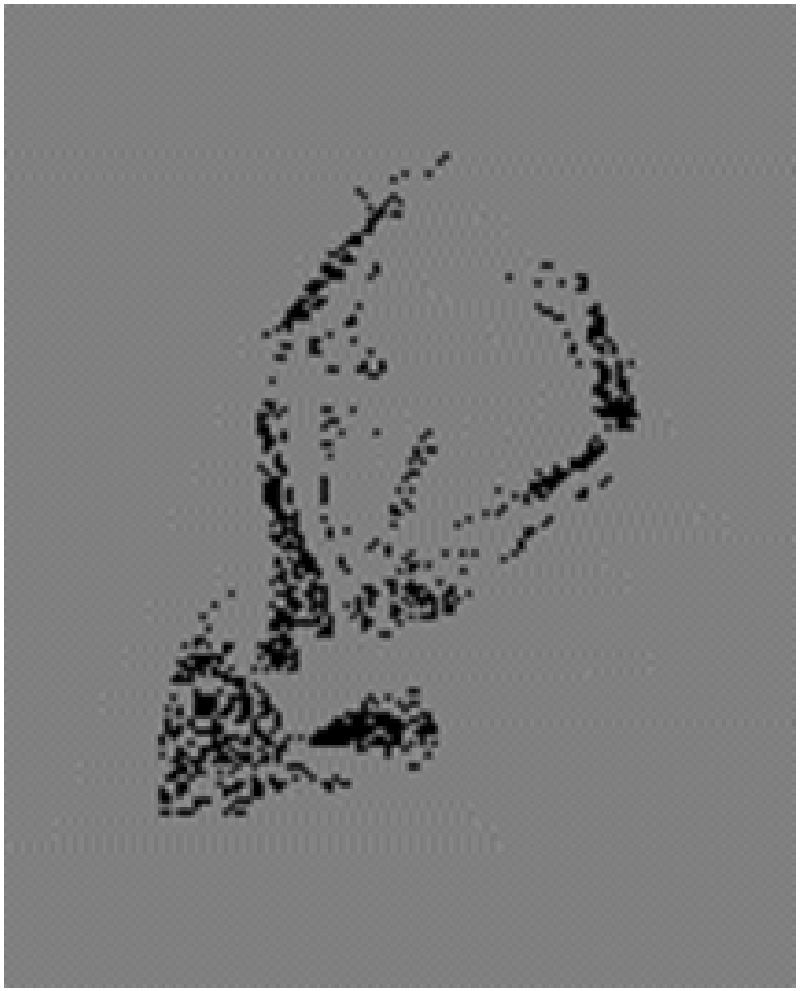
- Transforms from known profiles: RGB (*sRGB IEC61966-2.1*) and CMYK (*U.S. Web Coated SWOP v2*) to every single profile in the test.

- **238 profiles * 3 intents * 2 input = 1428 single tests**

Test Images

Differences





Conclusions

- A number of **qualification tests** have been performed by HP using the **proposed BPC specification**.
- The tests have found the results to be **robust** and **highly consistent** with the black point compensation feature offered by Adobe products.

Now for the discussion

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Dr. Andreas Kraushaar