#COLOR19

Extended-Gamut Update

Remaining Challenges, Neglected Opportunities

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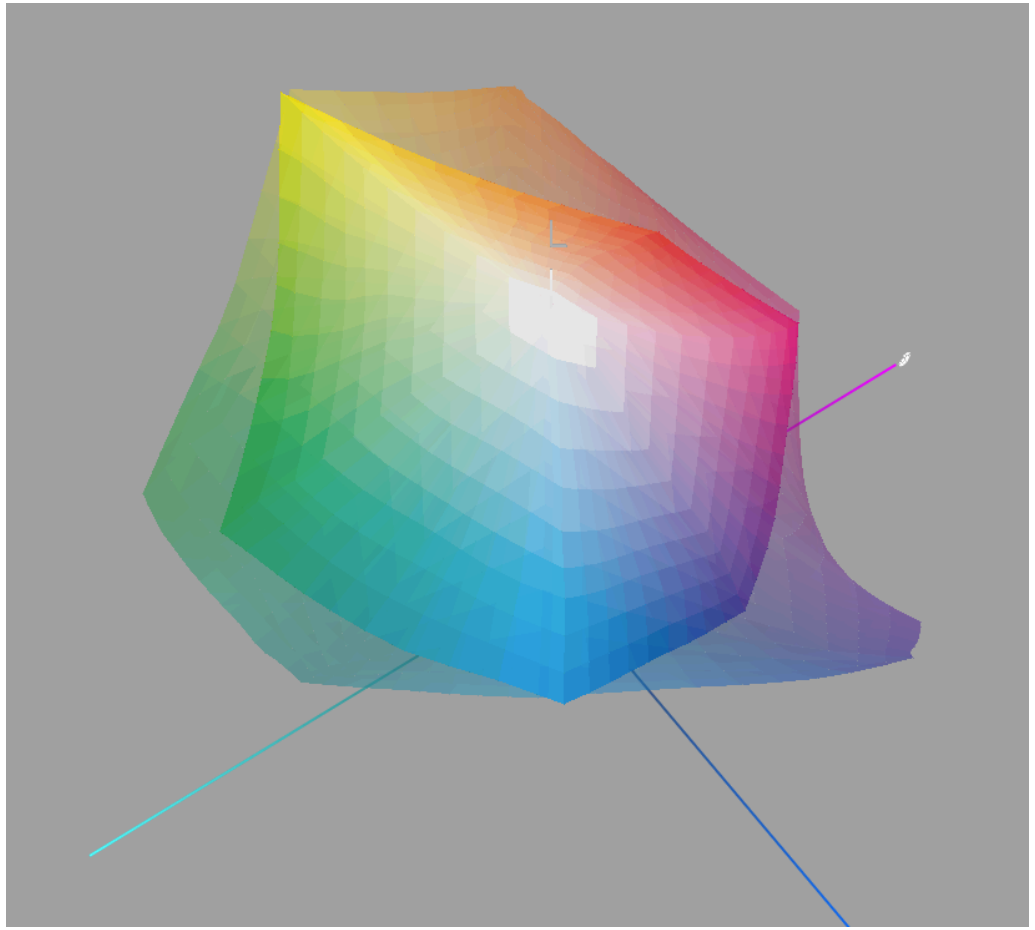
WHAT IS EXTENDED GAMUT?

Flexibly defined

- Printing with larger than "normal"enhanced CMYK gamut



WHAT IS THE PURPOSE?

- Print more colorful images, typically from RGB sources

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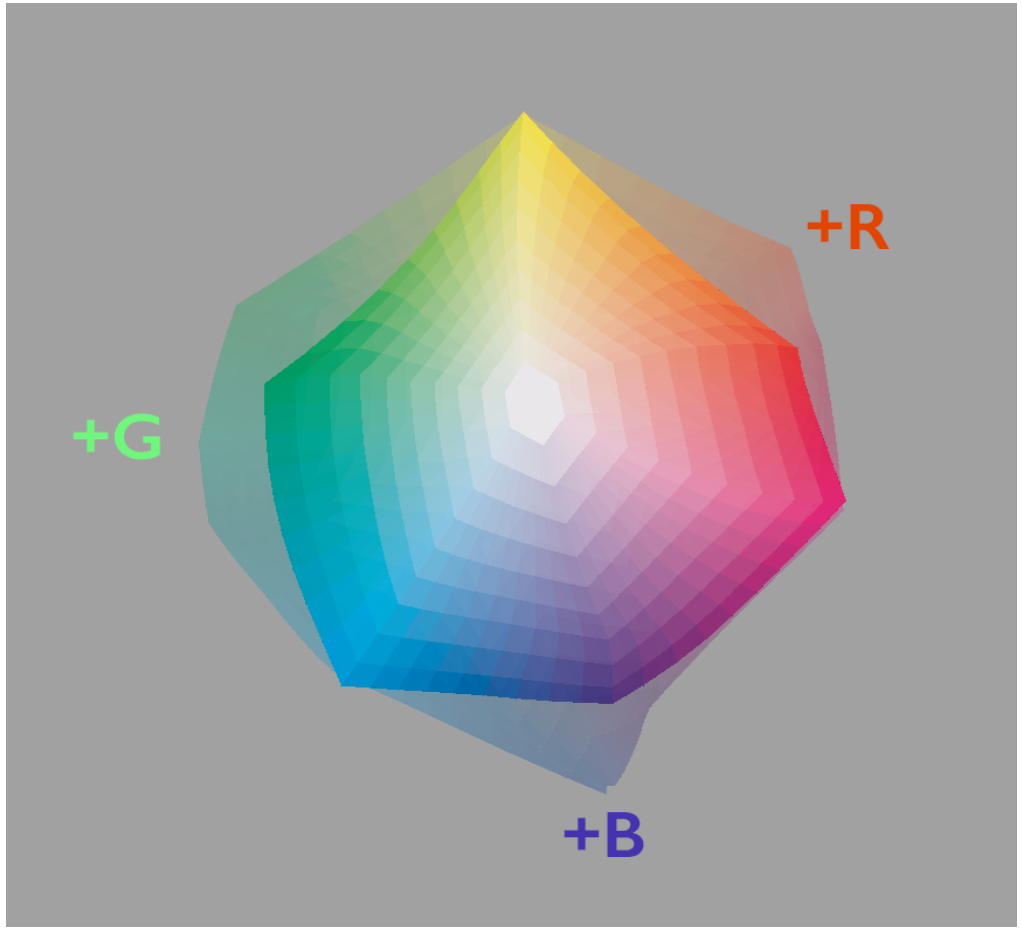
WHAT IS THE PURPOSE?

- Emulate spot colors with a fixed palette of inks

WHAT IS EXTENDED GAMUT?

How is it done?

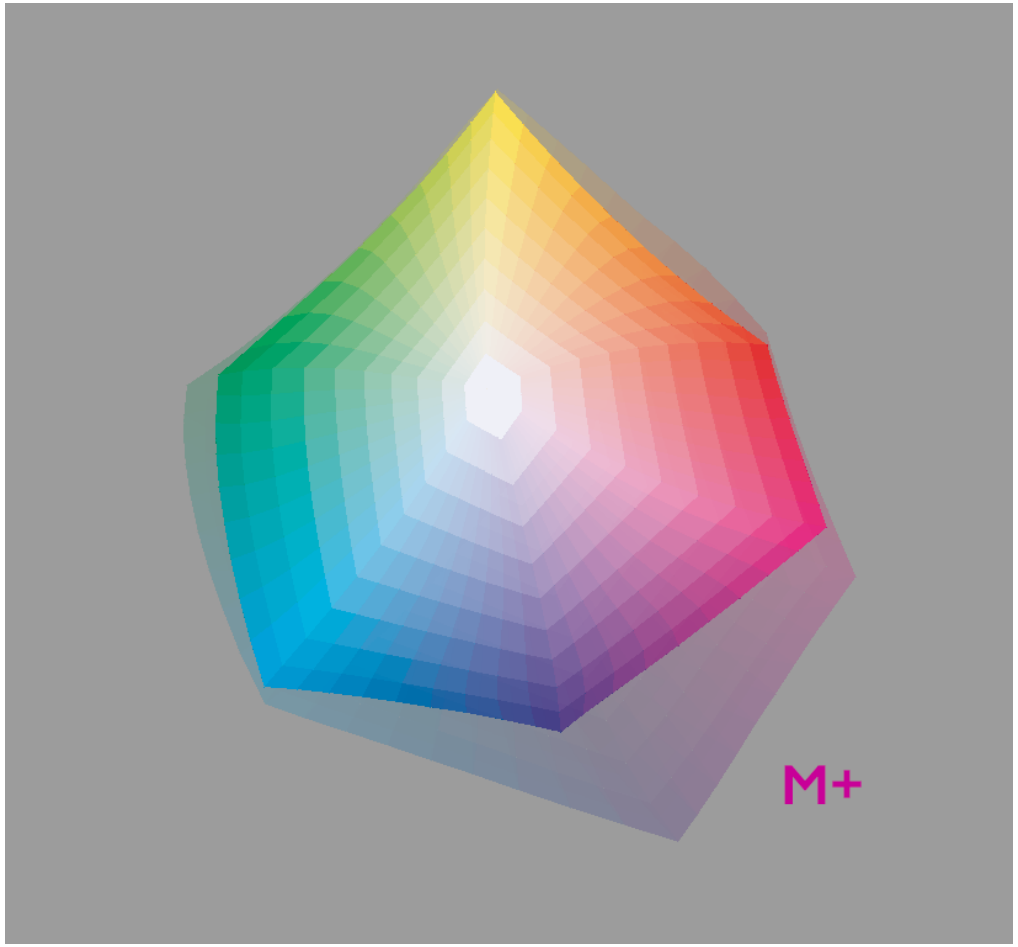
- CMYK with strong secondary inks (multicolor)



WHAT IS EXTENDED GAMUT?

How is it done?

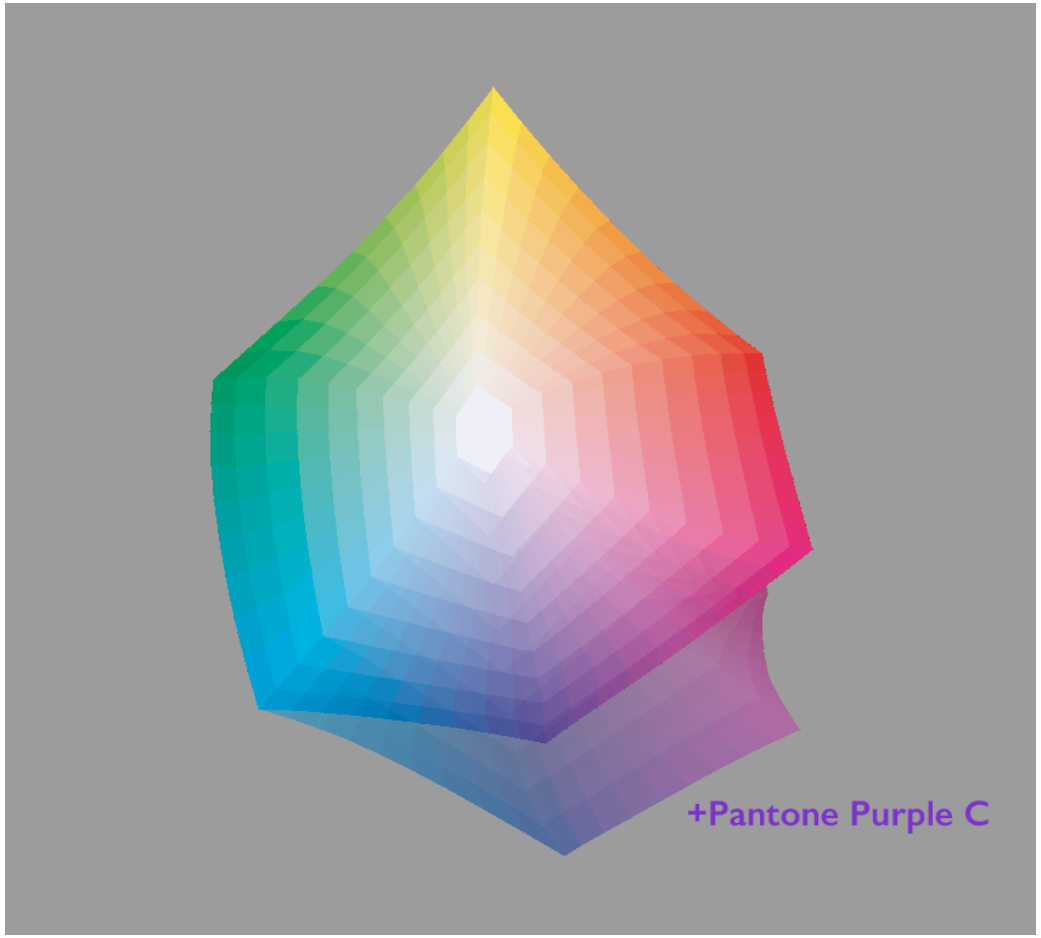
- Addition of one or more strong CMY inks
- Printing to higher densities



WHAT IS EXTENDED GAMUT?

How is it done?

- Addition of special targeted colors



WHY?

- Less ink mixing and inventory
- Reduced press washups
- Easier production planning
- Faster job prep
- Simpler proofing
- Lower costs

WHAT MAKES AN EG SYSTEM?

Design & Image Editing

File Conversion

Color management

Processing tools

Output

GOOD **SYSTEM** GOALS:

- Convert existing jobs
- No change in design practices
- Accurate conversion of images and vector objects
- Accurate screen previews and proofs
- Predictive reporting (spot colors)
- Automatic processing

GOOD **INDUSTRY** GOALS:

- Uniformity of results
- Widespread adoption of ISO specs
- Transparent processes, generic methods
- Adaptability to any printing type

How are we doing?

Some tests…

I. CONVERTING **IMAGES**

The Multicolor Separation

TEST: Convert an RGB Image

RGB Original

Converted to 7C

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Two Systems, Two Outcomes

System A

System B

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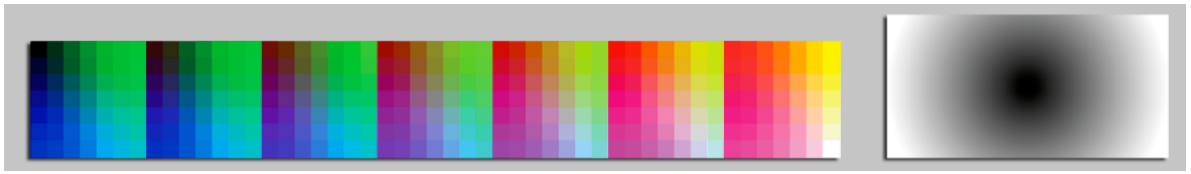
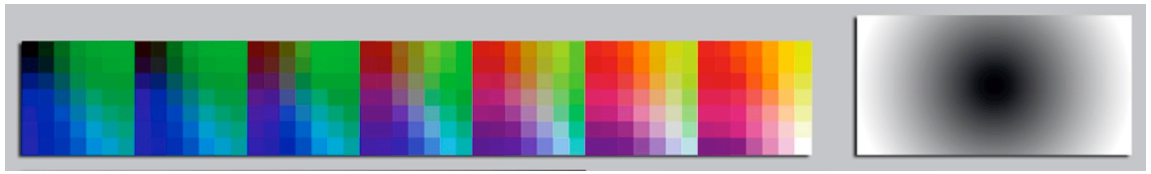
Two Systems, Two Outcomes





A

B

Two Separation Schemes

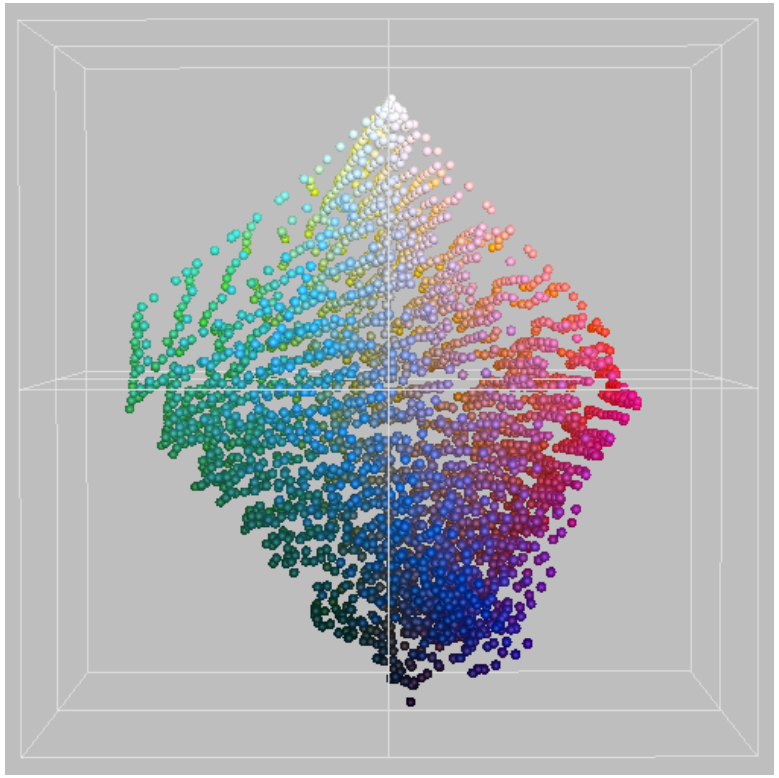
System A

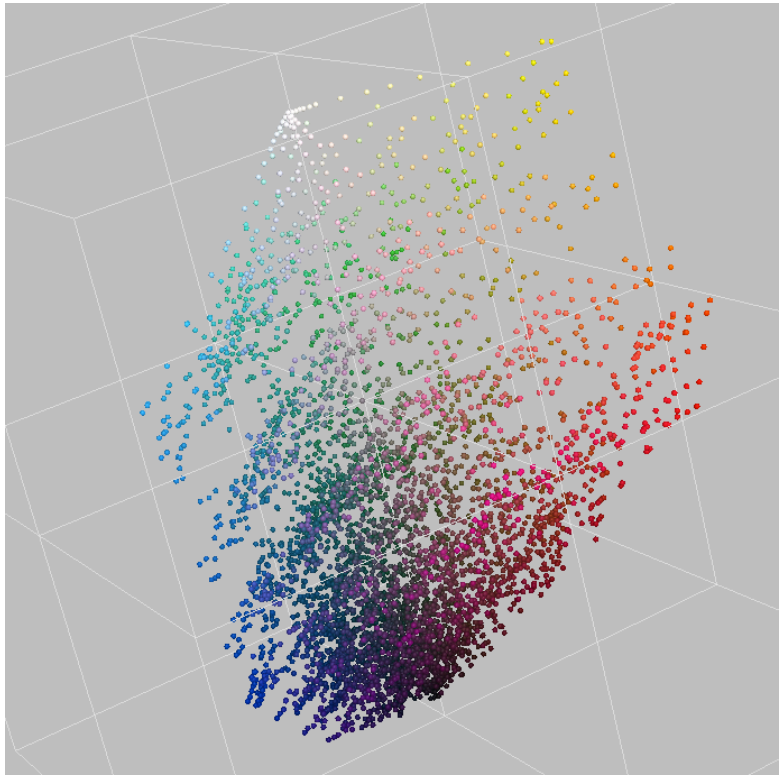
System B

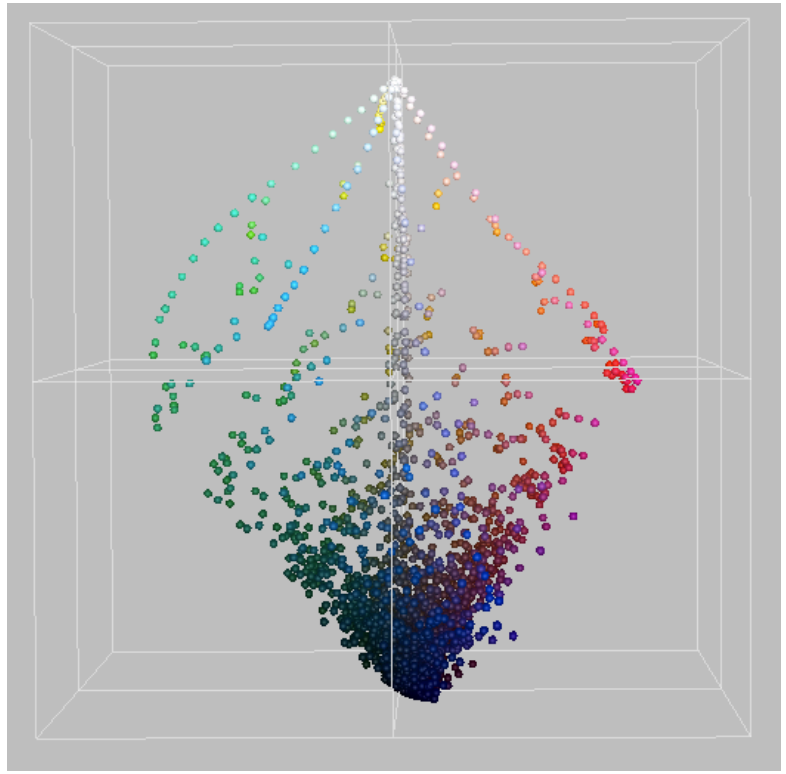
Overprint Rules

	System A	System B	System C
C+O:	OK	Barred	OK
M+G	OK	Barred	OK
Colors 5+ 6	OK	Barred	Barred
Colors 6+7	OK	Barred	Barred
Colors 5+7	OK	Barred	Barred
Additional special colors	OK	Barred	Barred

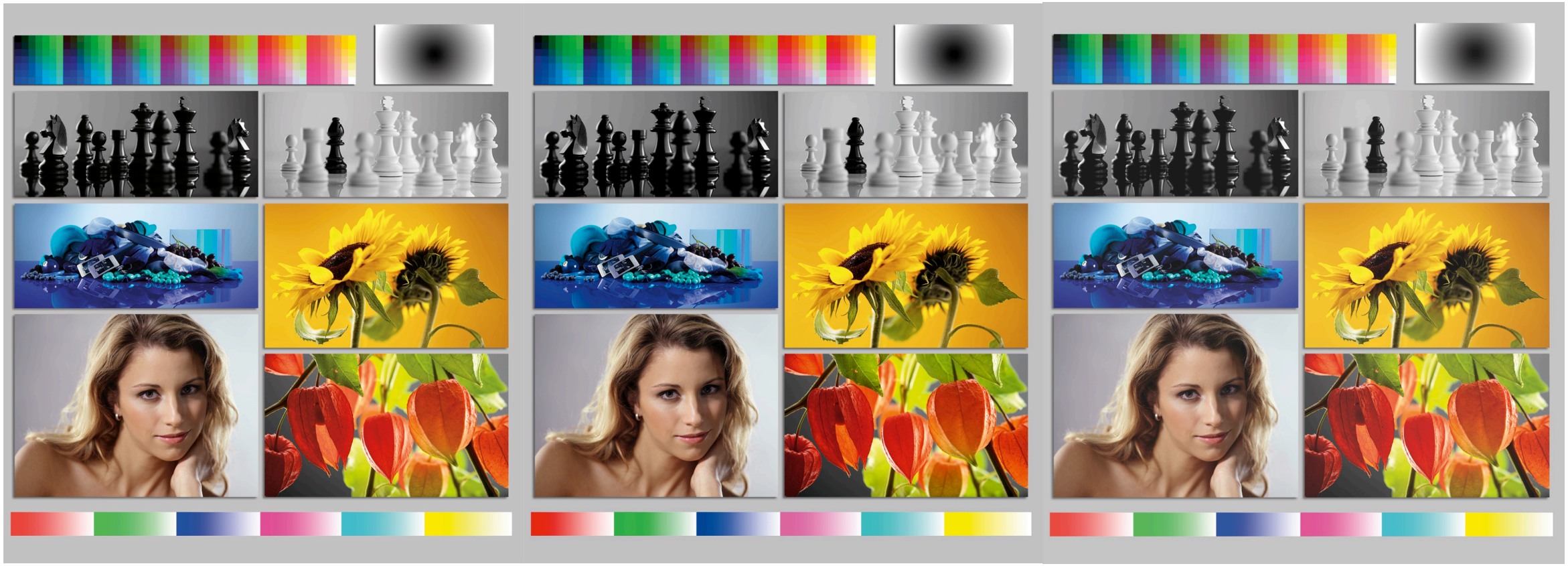
Profiles: A Variety of Sampling Schemes—a Method to the Madness?







Compare CMYK Consistency



A B C

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2. CONVERTING **SPOT COLORS**

Beyond Solids …

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Key considerations

- Accuracy
- Printability
- Reproduction of tints, overprints
- Matching of previously printed jobs
- System flexibility

How are *tints* calculated?

Spectral measurement (e.g., ISO-17972 / CxF/X4)

Over substrate

Over black

\+

Spectral Calculation Model

Simple arithmetical interpolation

Solid

Calculation: 92 C 90 V

50%

Interpolation: 46 C 45 V

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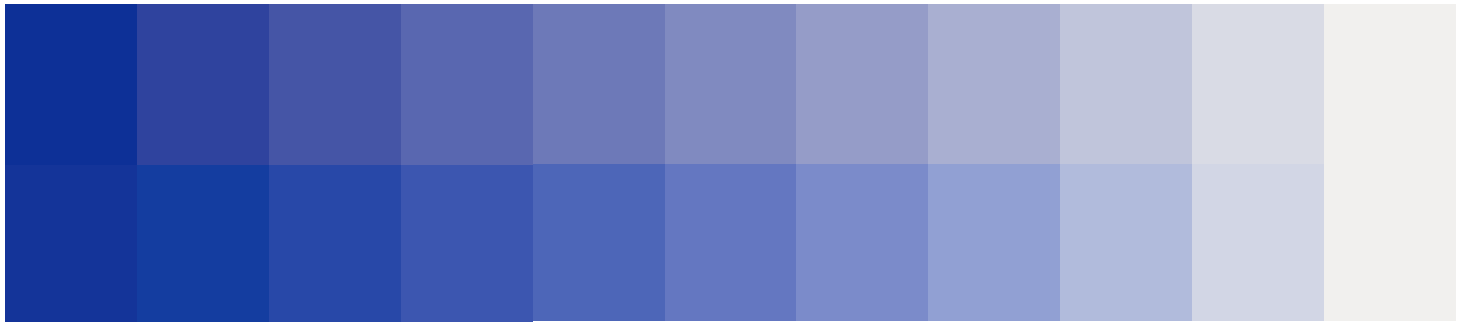
What are the results?

Conversion of spectral measurement per ISO-17972 (CxF/X4)

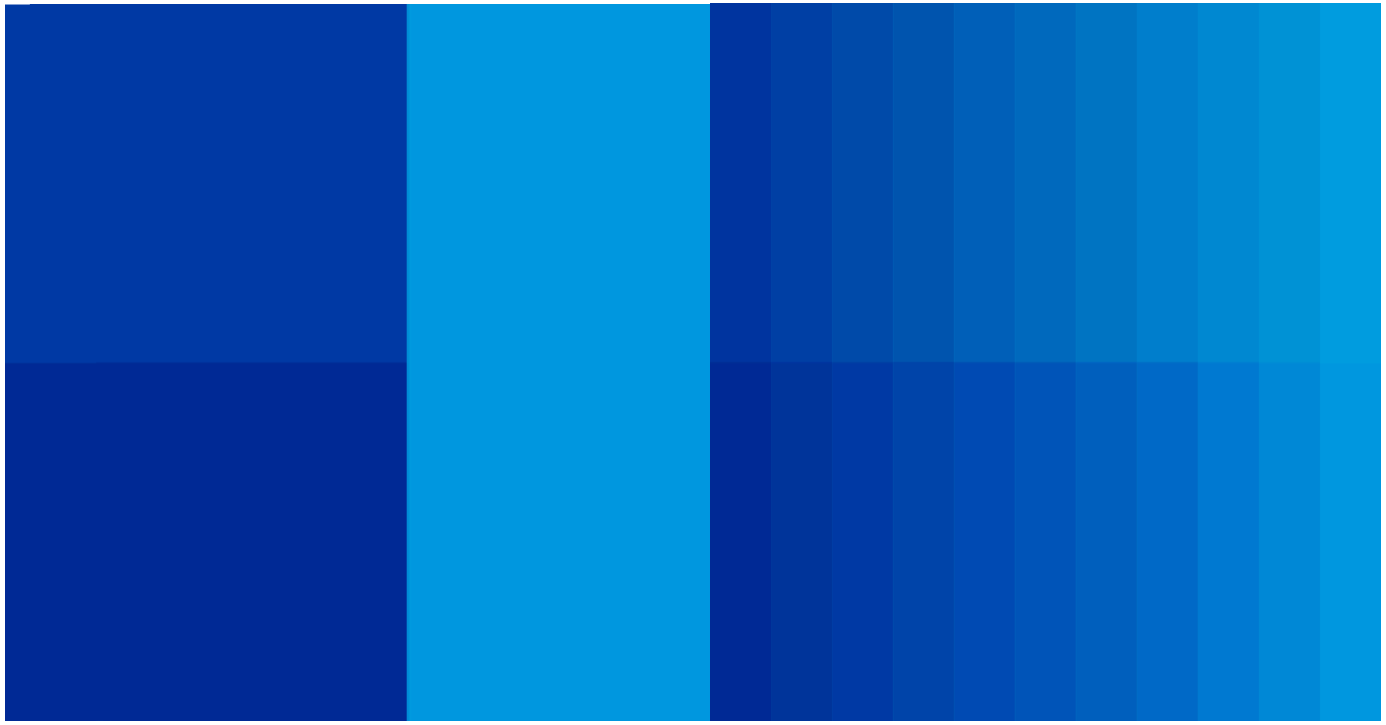
Simple arithmetical interpolation



How are *overprints* computed?

A. Calculation from spectral measurement

B. Simple arithmetical interpolation



Dark Blue over process cyan

TEST: Convert a Spot Color Design: Tints and Overprints

Composite

Cyan plate

Reflex Blue plate

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Results:

A

A/B

B

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Design Complexity = Conversion Challenges

Spot color vector objects

Transparency

CMYK vector object

Transparency

CMYK vector object

CMYK image

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3. MULTICOLOR IN **APPLICATIONS**

A matter of multicolor "blindness"

Design applications: limitations, inconsistencies

Incorrectly displays spot/n-color overprints

Display of spot colors affected by “alternate color space”

Incorrectly displays multicolor objects

Cannot convert to multicolor

Incorrectly displays spot/n-color overprints

Cannot use MC source profiles, working spaces

Info palette doesn’t show n-color channels

So where do things stand?

Remaining challenges:

- No agreed-upon criteria for evaluating ECG systems or developing features
- Inconsistent implementation of profiling, image and spot color conversions
- Persistence of “folk wisdom,” unexamined “rules” for multicolor printing
- Poor integration of applications into MC workflows
- Persistence of proprietary multicolor profile formats
- Product bundling limiting flexibility and inhibiting innovation

Where are some neglected opportunities?

- More intuitive designing with “live” print previews of MC output appearance in authoring apps
- Matching of *existing* conventional CMYK/spot color jobs for easy reprinting and faster makereadies
- Use of hi-fidelity RGB images for more appealing packaging
- Democratization of “fine-art” printing
- Simplified softproofing using multicolor-RGB conversions

Anything else?

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ECG-Relevant Developments

SCTV (ISO 20654): Improved characterization of spot color halftone gain

Pantone EG libraries: Standard EG sample book and Lab targets (CMYKOGV/AM screening only)

PDF 2.0 and CXF/X-4: Extended embedded characterizations of process and spot colors, print order, screening, many other improvements. Must be implemented by applications.

ICCMax: Spectral profile connection space for more efficient (and versatile) characterization of devices

ECG Studies

Expanded Gamut Study 2019

Jan-June 2019

Leader: Abhay Sharma
sharma@ryerson.ca

Professional Colour Communication for Multiprimary Printing (ECG)

Jan 2019 to Feb 2022

Leader: Andreas Kraushaar
Kraushaar@fogra.org

Thank You

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