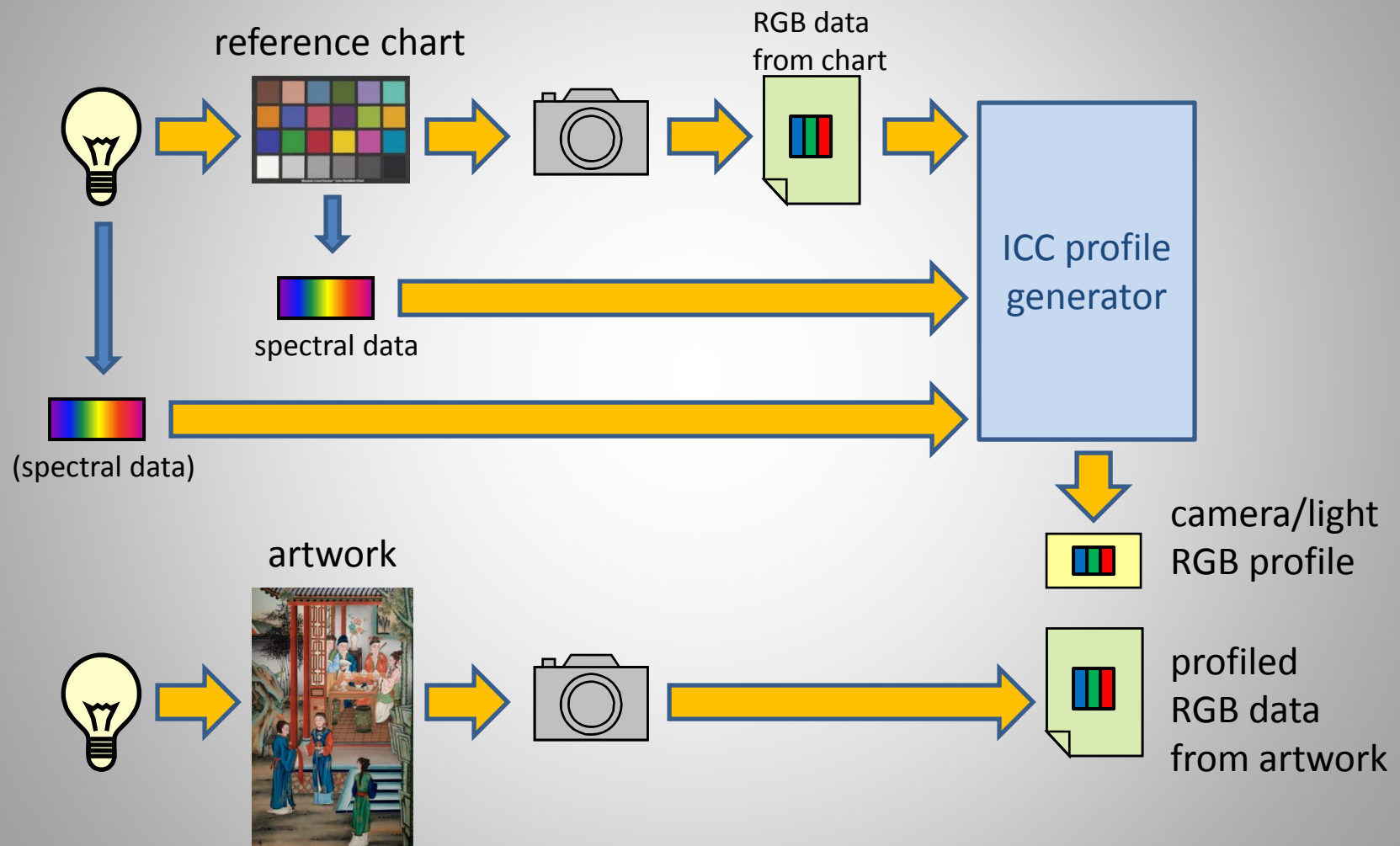# PERFECTING COLOR REPRODUCTION

New Method Utilizes Spectral Data

For Improved Accuracy

Current State of the Art

- An ICC camera profile indirectly characterizes the camera by analyzing the camera's response to a specific color chart under controlled conditions, and making a correction profile that standardizes the camera's response (to the expected values for the color chart)

- The same profile is then used to correct all subsequent images captured by the camera
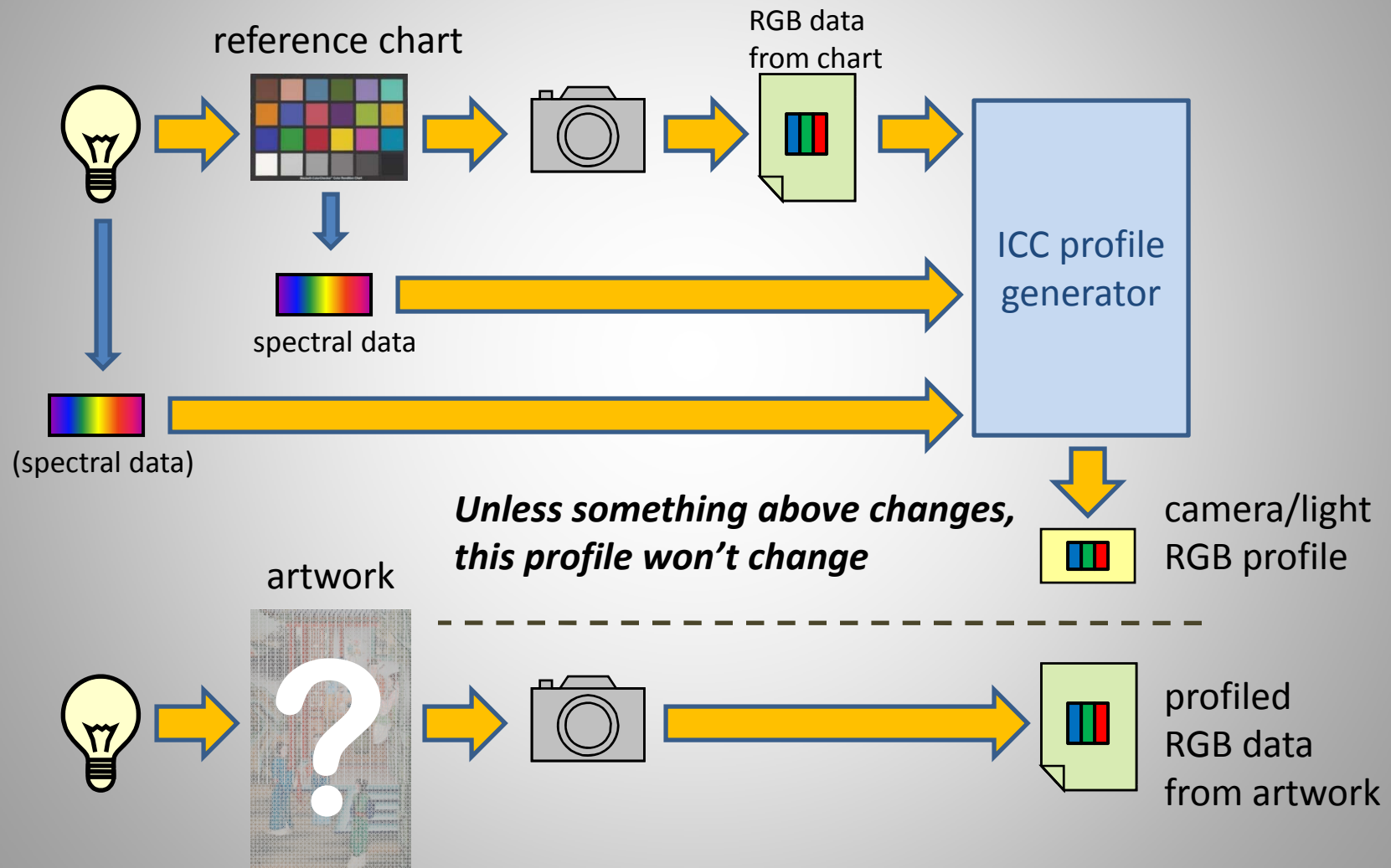
Indirect Camera Profiling Method

reference chart

RGB data from chart

ICC profile generator

spectral data

(spectral data)

camera/light RGB profile

artwork

profiled RGB data from artwork

Indirect Camera Profiling Method

- Most camera profiling software uses spectral data for the color reference chart

- Not all profiling software uses spectral data for the light source (just color temperature)

- Profile indirectly characterizes camera without knowing its spectral data

- Characteristics of artwork unknown

- One profile treats all subjects identically

A Camera Profile Doesn't Know Anything about the Artwork

reference chart

RGB data from chart

ICC profile generator

spectral data

(spectral data)

Unless something above changes, this profile won't change

camera/light RGB profile
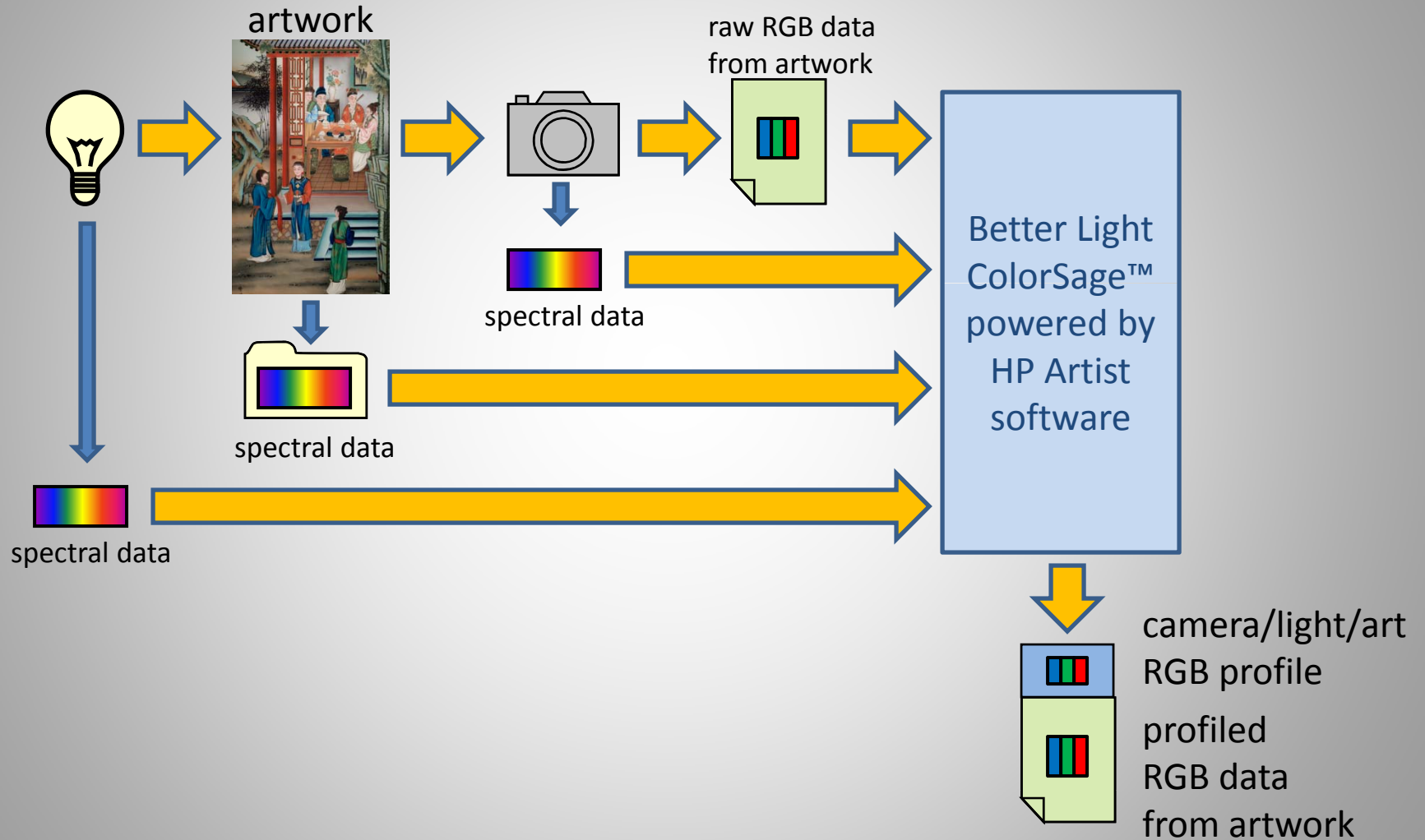
artwork

profiled RGB data from artwork

A Camera Profile Doesn't Know Anything about the Artwork

- Profile only knows camera's RGB response to specific reference chart spectra (for a specific or generic light source)

- Spectral characteristics of artwork might be significantly different than reference chart

- Potential color response errors between artwork and camera not known

- Exposure errors can introduce color errors

Perfecting Color Reproduction

- *Ideally*, the spectral characteristics of the artwork itself would be used to determine the colors in the printed reproduction

- *Ideally*, the spectral characteristics of the rest of the imaging chain would also be considered to ensure the most accurate reproduction

- *Ideally*, exposure would be less critical in determining the final result

Direct Spectral™ Method

artwork

raw RGB data from artwork

spectral data

spectral data

spectral data

Better Light ColorSage™ powered by HP Artist software

camera/light/art RGB profile

profiled RGB data from artwork

Direct Spectral™ Method

- Eliminates the color reference chart
- Uses spectral characteristics of a specific camera and a specific light source
- Uses spectral measurements from the artwork
- Generates a specific profile for each artwork
- Can compensate for color response errors between camera and artwork

Spectral Measurements?

- Most applications can use the relatively inexpensive X-Rite **i1 Pro** spectrophotometer

- Relatively small probe must gently touch the artwork surface for each measurement

- Make at least 50 readings of important colors in the artwork to help define its color gamut

- At 3 seconds per reading, takes 2.5 minutes
 - saves much more correction time later!

Overall Workflow Comparison

- In addition to scanning the artwork, scanning a white card in the same lighting can be used to correct illumination non-uniformity

- Corrected and profiled artwork file is opened in a color-managed image editing application for color correction, finishing, and printing

Camera Profile Workflow
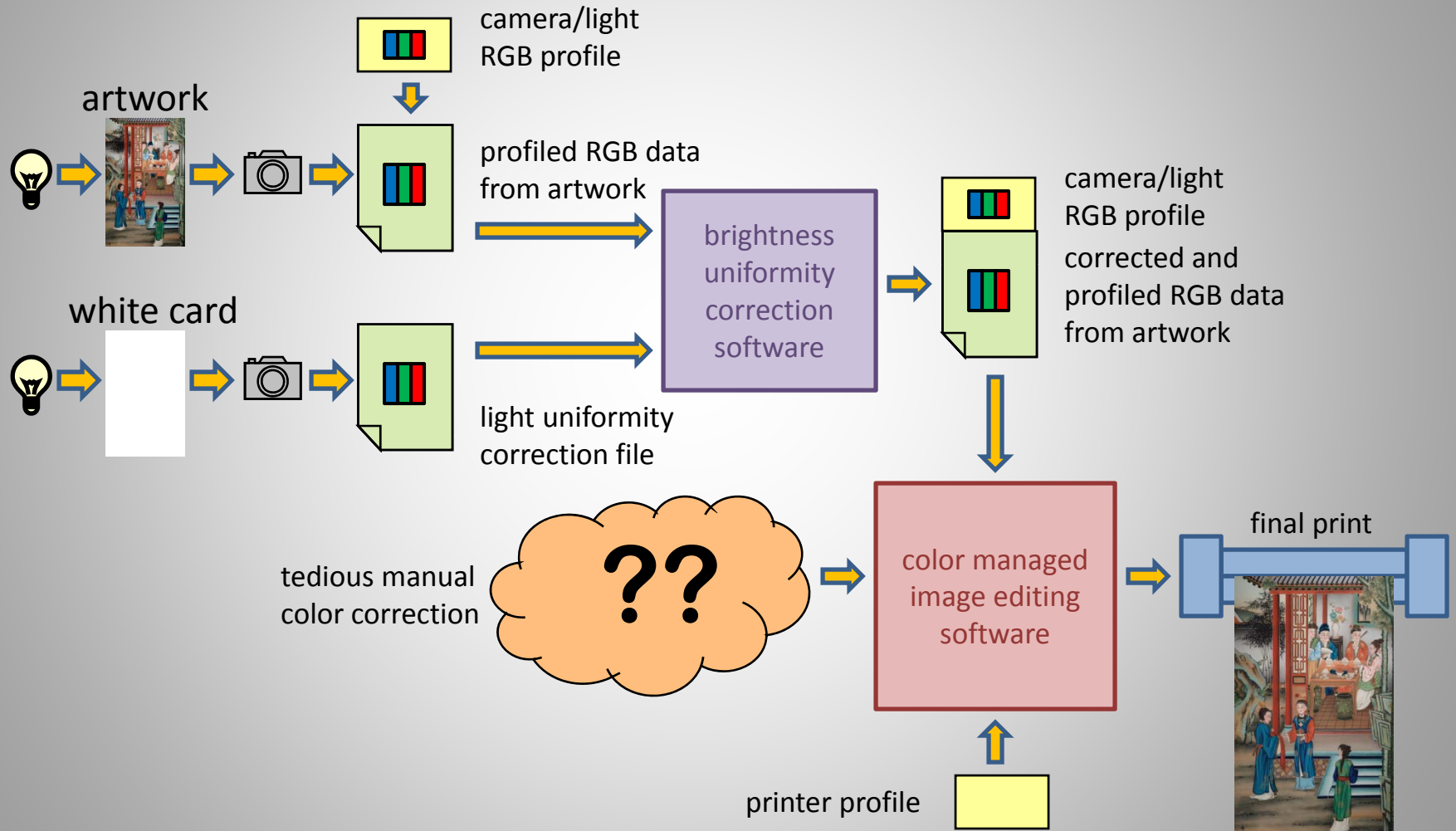
Direct Spectral™ Workflow
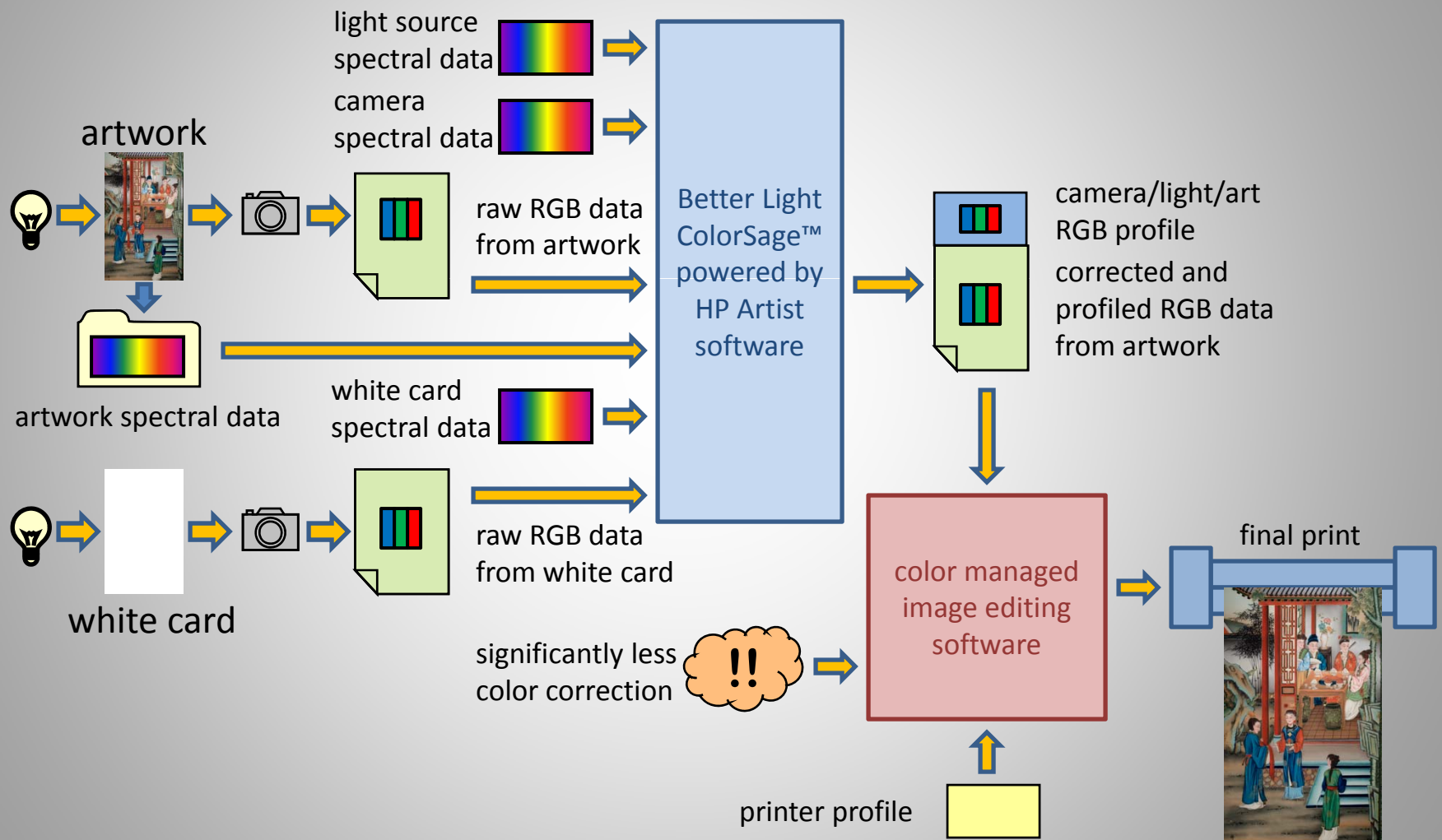
Direct Spectral™ Workflow

- Camera and Light spectral data are constant
- White card spectral data can be constant
- Capture artwork image file as raw data
- Capture white card image file as raw data
- Take at least 50 spectrophotometer readings of important colors in the artwork
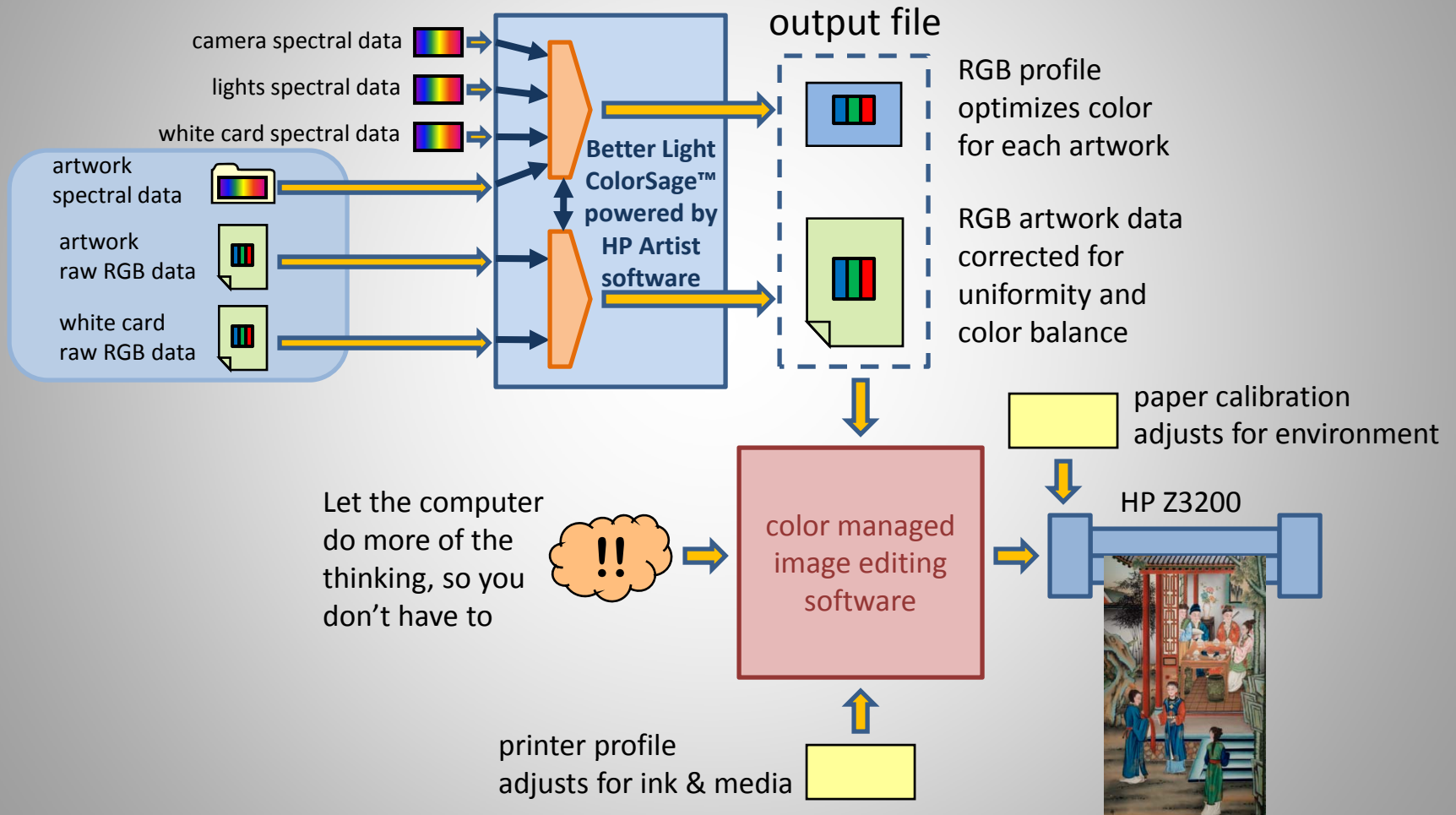- ColorSage™ does the rest

But Wait – There's More…

- One of the biggest challenges in reproducing fine art is getting the PRINT copy to match the original's characteristics

- HP Artist software was developed for use with the new HP Z3200 wide-format printers (connected printer required for operation)

- HP Z3200 printers feature built-in spectral analysis of ink/media characteristics
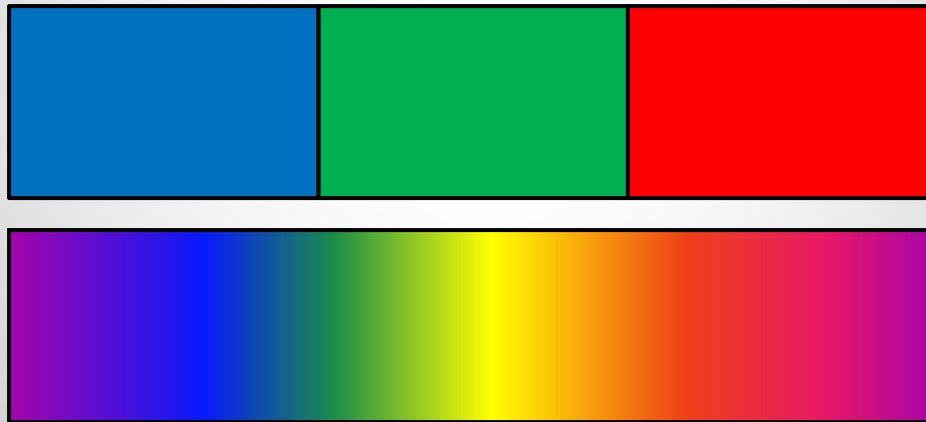
HP Z3200 Wide-Format Printers

- Next generation 12 ink HP color technology
  - LC, M, LM, Y, R, Gn, B, PK, MK, Gy, LGy, Enhancer
- Built-in **i1** spectrophotometer
- Fully automatic paper calibration and profiling
  - Calibration adjusts for environmental changes
  - Profiling adjusts for media/ink characteristics
- Automatic print head alignment/maintenance
- User replaceable print heads

Complete Direct Spectral™ Workflow

camera spectral data

lights spectral data

white card spectral data

artwork spectral data

artwork raw RGB data

white card raw RGB data

Better Light ColorSage™ powered by HP Artist software

output file

RGB profile optimizes color for each artwork

RGB artwork data corrected for uniformity and color balance

Let the computer do more of the thinking, so you don't have to

color managed image editing software

paper calibration adjusts for environment

HP Z3200

printer profile adjusts for ink & media

Improve your fine art reproduction by using more colors in your workflow!

BETTER LIGHT ColorSage™

powered by HP Artist software