



## Consistent Color for Animation, Graphics and Visual Effects

One of the fundamental problems of modern digital post production is matching color imagery produced in animation and effects packages to the look of the imagery as seen on film. Not having a solution to this problem can be a major source of lost time and extra work in the digital post-production process. Moreover, to be of maximum benefit for current post-production models, an ideal solution would have to enable a not just a match from monitor to film but also between the wide variety of applications and users in the pipeline.

### Mix and Match

Film budgets and schedules have become smaller and shorter and in turn so have the budgets and delivery timelines for post. Digital post-production, visual effects and animation companies have less time to produce a higher quantity of imagery at higher quality levels that are more integral to story and action than ever before.

While these shots must play seamlessly within the final movie, they are typically produced using digital images and specialized video monitors that do not match the resolutions and color parameters of the printed film. Lengthy trial-and-error processes once relied upon to reconcile the different parameters are no longer acceptable for the short turnaround times required in today's productions. Developments including the now-widespread use of Digital Intermediates, direct interchange of digital files between facilities and increasingly collaborative nature of large-scale visual effects features mean that while film negative is still the end medium for visual effects, that end product may not be seen by those doing the work until the film is screened in the theatre – a risk most facilities would rather not take.

### A Color Symmetry Solution

Developing a solution for color consistency in the digital post-production workflow involves enabling several key capabilities. First is eliminating the gap between the image presented on a monitor and the image created by projecting film. Second is eliminating the differences between the ways that different applications (animation, compositing, rendering, etc.) handle color. Third is providing consistency among 2D and 3D toolsets to help to bridge the gap between the 2D world of live-action imagery and the 3D universe of lighting, rendering, and high-dynamic range results. And fourth is supporting widely available interchange formats so that data can be interchanged between multiple facilities.

Color Symmetry, a suite of software plug-ins, achieves all of these, providing the ability to preview the look of printed film on a monitor and accurately work with color across different mediums, toolsets, and even facilities.

### Film Look Emulation

Color Symmetry represents the characteristic "look" of different film stocks, real and imagined, using Film Profiles. Different film stocks and development processes vary in their contrast, saturation, color handling, shoulder (how they absorb bright light, etc.), and toe (how they absorb dim light). The Film Profiles incorporated into Color Symmetry can represent all of the important features of a film stock's look and recreate them faithfully on a monitor. Additionally, film stock looks not related directly to any existing film stock, such as those generated daily in the Digital Intermediate (DI) process, can be easily represented by Color Symmetry as well.

One of the elements used by a Film Profile to represent the look of a film stock is a 3D Look-Up Table, or 3D-LUT. A 3D-LUT can be thought of as a large grid of numbers that maps one set of Red, Green and Blue color values to another set of Red, Green and Blue color values. In the case of a Film Profile, the grid encodes the amount of color that will pass through a print film stock compared to the amount of color that is projected on it. Earlier types of Look-Up Tables, known as 1D-LUTs, used in older systems could match the intensity of light that a print film stock would pass through given the intensity of light projected on it. However, they cannot record the changes in

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saturation, cross-talk, color balance, and other elements of a film stock's response to light that give each stock a signature look. The 3D-LUTs used in the Film Profiles by Color Symmetry are significantly more powerful in representing a particular film stock's look.

## Consistent Worlds for 2D and 3D

In addition to Film Profiles and 3D-LUTs, Color Symmetry provides full support for Cineon/DPX Log color image data as well as floating-point HDR Linear color image data. This support extends film-based terms such as stops and printer-lights directly from the Log-based compositing world into the floating-point Linear arena of 3D rendering. The emergence of high dynamic range imaging over the last decade has allowed images created in 3D packages to begin to match the intensity and vibrancy of those created using live-action elements. Without the tools to properly combine 2D and 3D work, the job of compositing live-action and computer-generated imagery often turns into a tug of war between different elements and the different treatments applied to those different elements.

Color Symmetry lets 2D and 3D applications see the world of color and light in the same way using the Film Profiles of its core library together with color correction and transformation techniques. All plug-ins for applications supported in the Color Symmetry suite are based around a core library that incorporates Film Profiles, 3D Look-Up Tables (3D-LUTs), high dynamic range imaging, logarithmic processing, and industry-standard color correction techniques. Using one core library of techniques assures consistent results wherever the plug-ins are used. Even with applications based on radically different underlying technologies, Color Symmetry plug-ins provides the same interface and produce matching results.

## Supported Digital Post-Production Packages and Workflow

Color Symmetry plug-ins bring color consistency to the digital post-production workflow via a range of professional imaging, compositing, 3D animation, rendering and editing applications, including:

- Autodesk Maya
- Autodesk Toxik
- Autodesk 3ds Max
- Adobe After Effects
- Adobe Photoshop
- Apple Shake
- Avid XSI
- Eyeon Digital Fusion
- Iridas Framecycler
- Newtek Lightwave
- OpenFX

Color Symmetry plug-ins for 2D applications such as Shake, After Effects, Toxik and Digital Fusion function as a set of nodes and display LUTs. Images produced by scanning film usually enter the digital post-production pipeline as Cineon/DPX Log images which are low-contrast and do not remotely resemble the film print stock look. Within a 2D package, Color Symmetry and its Film Profiles can be used to apply the look of a given stock and Color Symmetry's color correction nodes can additionally be used to adjust the exposure, color balance, saturation and contrast of the log image. When working with Log imagery, Color Symmetry nodes and LUTs can be run in Log mode to correct, process and display the images properly.

For 3D packages like Maya, 3ds Max and XSI, Color Symmetry plug-ins exist as a set of nodes that can be used directly in material graphs to color correct input textures and results, and can also be used as output shaders or filters for properly displaying renders. Much like film scans delivered as Log images, 3D renders do not have the look of any film stock by default. Color Symmetry's Film Profiles can be used to apply the look of a film stock to solve this issue and ensure that the 3D renders will match the 2D composites.

Color Symmetry integrates directly into production renderers such as mental images Mental Ray and Splutterfish Brazil in the event that command line rendering support is required.

The Color Symmetry plug-in suite also includes a set number of command-line and GUI-based applications which help extend its coverage to applications that are not directly supported.

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## Core Advantages

The Color Symmetry plug-in suite offers a solution to the challenging problem of previewing the look of film while creating digital post-production and visual effects images. With support for the broadest range of industry applications and by providing matching film profile display and color correction operations within each supported application, Color Symmetry also effectively eliminates color disparity between different packages and departments. The process of handing off of elements between 2D to 3D teams is streamlined. Elements can be passed to the most logical location for the work to take place. Interchange of elements is accelerated and the need for redundant copies of data is reduced.

Color Symmetry reinforces the idea that everyone is working with the same tools and on the same data, helping to establish common standards throughout the production pipeline. This extends to enabling data interchange between facilities and collaborators working on the same project. For example, the colorist creating the look of the film can pass that look back to the visual effects houses creating final elements so that all parties are seeing the same thing. The DP might in turn modify that look and pass the result along again using the same set of tools to preview the look and to communicate to others.

All of these benefits strengthen and streamline the workflow and allow time and money to be saved through the phases of digital post-production.

## Film “Look” Creation and Authoring

A further extension to Color Symmetry introduces a full-featured “look” authoring system to the suite. From within popular artist toolsets, the Color Symmetry look creation process will allow anyone to create a fantasy film look and instantly use it in any of the already-supported applications.

