

ARE YOU READY FOR?

# THE DEATH OF FILM



Still from The Godfather, shot with Arri's D20

## IN A NEW ARTICLE SERIES DAVID STUMP, HEAD OF THE ASC'S CAMERA COMMITTEE, DESCRIBES THE CURRENT CROP OF DIGITAL CAMERAS, LOOK MANAGEMENT PRODUCTS, CAPTURE DEVICES, MONITORS AND PROJECTORS TO PREPARE YOU FOR THE ARRIVAL OF THE INEVITABLE DAY

Film has distinctive photographic response characteristics that have defined cinematography's aesthetic canvas since the inception of motion pictures:

- Wide dynamic tonal range
- Distinct shadow and highlight reproduction
- Distinct colour gamut reproduction
- Wide range of photographic speeds (EI/ASA)

High-resolution Digital includes HD video and non-video modes of image capture:

- HD rec709 video recorded on 10bit HDSR tape
- Less dynamic tonal range than film
- Different highlight and shadow reproduction vs. film
- Different colour gamut from film

Rec709 'HD video' has the so-called advantage that 'what you see is what you get' using a calibrated rec709 Sony BVM HD monitor. The disadvantage is that you walk away from the set with only this limited information.

When shooting in HD rec709 mode, most cameras have ways of manipulating the image, such as 'gamma', 'contrast', and 'knee' corrections which are 'baked' into the original image capture.

Further colour correction can be performed on this material, but you can't retrieve any lost shadow or highlight detail resulting from 'baked in' colour correction. This can result in problematic colour transform for print film-out.

High-resolution Digital includes HD video and non-video modes of image capture.

### EXTENDED RANGE LOG MODE ON 10BIT HDSR TAPE

This mode has a wider dynamic tonal range closer to film, but not quite equal:

- You record more shadow and highlight detail which can be used in post production for final grading.

You can achieve film look emulation (colour/contrast) via look management. To properly view what a final image could look like, a 'look management system' must be used in order to transform the 'extended range images' recorded from the camera into viewable images on a monitor display that contain correct contrast/colour.

There are several such systems – some are specific to a particular camera model, others attempt to be more generic, but the general idea is to allow the cinematographer on the set to create and/or 'preview' how the final image could look without destructively 'baking' this look into the recorded image.

The disadvantage is each digital motion picture camera implementation of log or quasi-log mode produces its own 'unique flavour' of 'extended range images'.

### RAW DATA MODE RECORDING TO DISC RECORDERS

This mode captures higher resolution and greater colour bit depth than HD rec709 or extended range log mode recording on 10bit HDSR (1920x1080) e.g.,

- Dalsa Origin (4Kx2K) 14bit (linear) Raw Bayer data converted to RGB TIFF, DPX or Cineon files.
- ARRI D-20 (3Kx2K) 12bit Raw Bayer data to RGB TIFF; DPX or Cineon files.

This mode allowed for file-based, non-linear random access to recorded images, and integration of cinematographer's look management reference settings

You also achieve on-set control of down conversion for HD or SD dailies and AVID or Final Cut Pro ready dailies that incorporate cinematographer's look management settings.

To view what a final image could look like, a 'look management system' has to be used to transform the raw camera image into a viewable image on a monitor display and/or digital projected with desired contrast/colour.

It is vital to capture and record as much dynamic range as possible for final colour grading using non-destructive look management settings. ▶



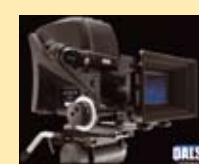
## High Resolution Digital Motion Picture Cameras - circa 2007

### ARRI D-20 (SINGLE SUPER 35MM CMOS IMAGE SENSOR)



- HD rec709 video mode recorded on 10bit HDCAM-SR1 portable VTR or DDR
- Extended range quasi-log recording on 10bit HDCAM-SR1 portable VTR or DDR
- Raw Bayer 12bit data mode recording to a disc recorder (3Kx2K) Requires post conversion of raw data to RGB TIFF or DPX files for workflow viewing.
- Optical Viewfinder

### DALSA ORIGIN 4K



- Dalsa Origin4K (single Frame Transfer CCD image sensor, larger than Super 35mm)
- Raw 14bit Bayer data mode recording to disc recorders at 4096 x 2048. Requires post conversion of raw data to RGB TIFF or DPX files for workflow viewing.
- Records to Codex or other DDR via Fiberoptic
- Optical Viewfinder for operator viewing.

### OLYMPUS OCTAVISION 4K



- Olympus Octavision 4K (4 x 2/3 inch CCD image sensors)
- 3,840 x 2160 Pixels from 4 CCD, quasi Bayer pattern array gives quad HD YCbCr HD outputs.
- Records via fiberoptic link to Octavision or via quad single link HD to KG DDR.
- Onboard LUT and Gamma adjustment Capability.
- Electronic Viewfinder only.

### PANAVISION GENESIS



- Panavision Genesis (single Super 35mm CCD image sensor)
- Extended range 'Panalog' mode recording on 10bit PANALOG transforms the 14 bit per colour linear output of the Genesis A/D converters into a quasi-log 10 bit per colour signal that enables the RGB camera signal to be recorded on 10 bit recorders including, but not limited to, the dockable HDCAM-SR1 portable VTR
- Electronic Viewfinder only.

### PHANTOM 65 4K



- Vision Research Phantom 65 4K (CMos image sensor, Super 35mm)
- 14bit super 35 CMOS sensor rated ISO 600.
- Records up to 120 fps in 1 fps increments, shutter speeds down to 2 microseconds.
- Records to onboard Flash memory packs up to 16 Gigs, outputs configurable to 65mm 4096 x 1860, UHD 3840 x 2160, 1080i, 1080psf, 1080p and 720p.
- Electronic Viewfinder only.

### RED CAMERA 4K



- Red Camera 4K (single Super 35mm CMOS image sensor)
- 4520 x 2540 active pixel Bayer pattern array
- Outputs 2540P (4K), 2K, 1080p (all at 4:4:4), 1080p, 1080i, 720p (at 4:2:2)
- Optional Redcode Compression Codec for RAW data, and all other formats.
- Electronic Viewfinder only.

### SONY F23



- Sony F23 (3 x 2/3inch CCD sensors)
- HD rec709 video mode and 4:4:4 modes recorded on 10bit dockable HDCAM-SR1 VTR
- Extended Sony quasi-log mode with ability to create custom response curves. Records on 10 bit dockable HDCAM-SR1 portable VTR.
- Electronic Viewfinder only.

### THOMSON VIPER



- Thomson Viper (3 x 2/3inch CCD sensors)
- HD rec709 video mode recorded on 10bit HDCAM SRW1 portable VTR
- Records 10 minutes of 4:4:4 material to optional untethered Venom Flashpack.
- Raw 'film stream' quasi-log 10-bit RGB data mode to disk or HD tape.
- Electronic Viewfinder only.
- On-set Look Management

The full dynamic range of the 'uncorrected' images should be recorded, along with a 'CDL (colour decision list) recipe' which can then be used non-destructively to apply the cinematographer's 'look' to the original camera images as displayed via monitor or digital projector.

### ASC COLOR DECISION LIST (ASC-CDL)

The CDL provides a cross platform data exchange for RGB primary colour grading and correction. It also provides a framework that allows the interchange of basic colour correction functions between colour correction systems made by different manufacturers.

### LIFT, GAIN, GAMMA

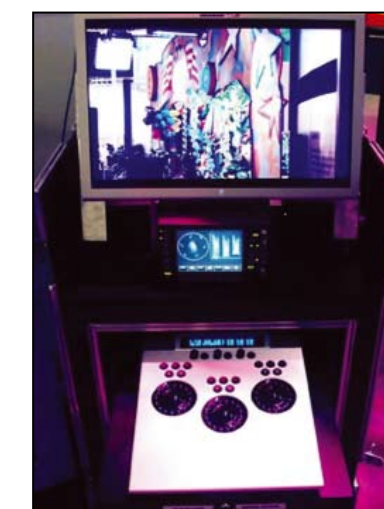
The terms Lift (dark tones), Gain (highlights), and Gamma (mid-tones) are commonly used by most colour correction systems, but those definitions may vary in detail from system to system and manufacturer to manufacturer.

### OFFSET / SLOPE / POWER

To avoid controversy, competition, and confusion, the ASC proposes a set of three defined transfer functions with unique names.

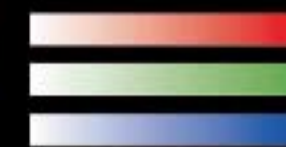
### NINE IMPORTANT NUMBERS

Offset (lift), Slope (gain), and Power (gamma) parameters for each of the red, green and blue colour components; thus the three transfer functions for the three colour components can collectively be described by nine parameters. ■



### NEXT ISSUE

David looks at On-set Look Management Applications; Disk-based motion picture field recorders, digital cinema tape formats; displays for on-set monitoring and Digital Projection



Gerhard Baler,  
CEO  
BandPro Munich

"The only thing this camera can not do is writing a good script"

See us at IBC in Amsterdam, Booth #11.238 from 27th - 11th September 2007

BANDPRO MUNICH GMBH  
KARL-HAMMERSCHMIDT-STR. 36  
D-85609 DORNACH/MÜNCHEN

PHONE: +49 89 94 54 84 90  
FAX: +49 89 94 54 84 99  
WEB: WWW.BANDPRO.DE

bandpro  
MUNICH GMBH

### LUTS

The basic (RGB primary colour grading) 'look' for a scene can be established on-set and saved as 3D look-up tables (LUTs) which can then be used to establish the 'look' for dailies, editorial, and preview screenings. This initial cinematographer's 'look'

reference can also provide a starting point for the final colour correction.

It must be emphasized that for maximum flexibility in the final colour grading, the on-set 'look' should not be 'baked' into original image capture.