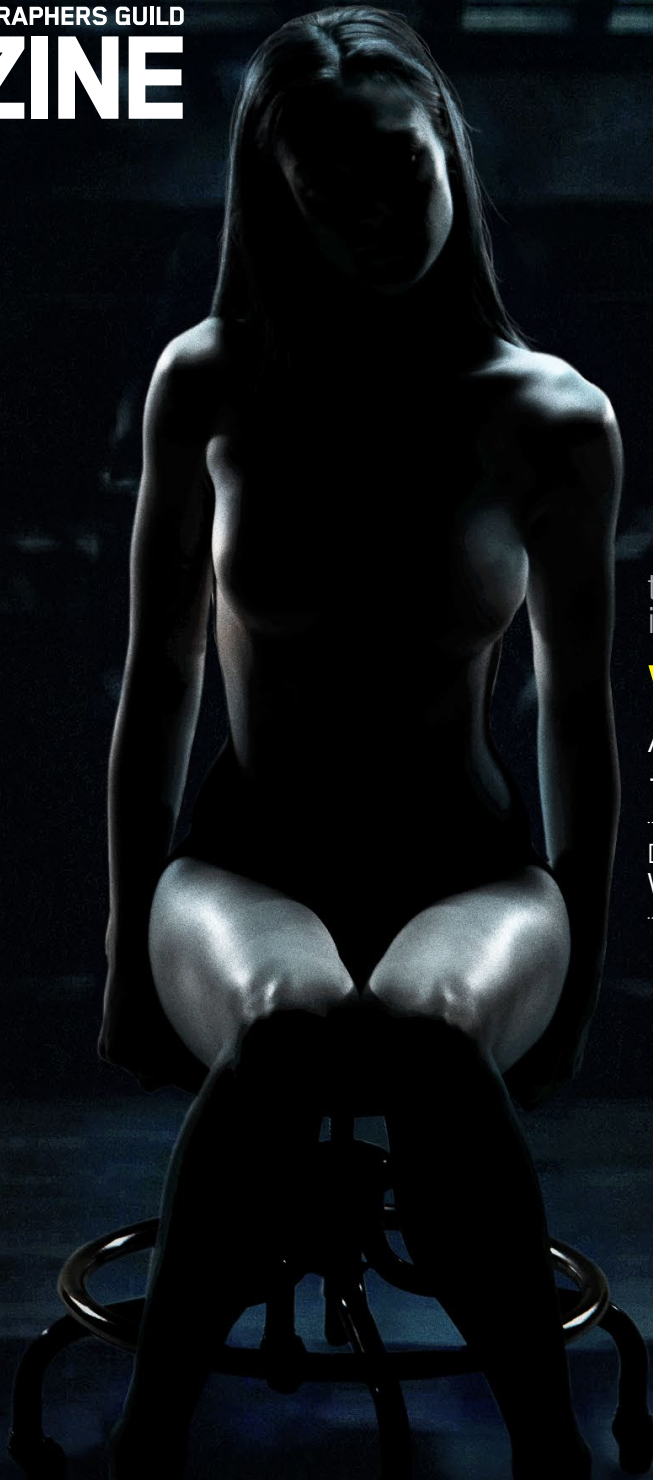


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the **WORKFLOW**
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WESTWORLD

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+ BEFORE I WAKE

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REFRACTION



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I have been around production and post-production for a long time. I've been through the digital revolution that first took over editorial with the advent of commoditized non-linear editing (NLE) systems, through the transition from photochemical finishing to digital intermediate (DI) and from film to digital distribution (DCI). It's a dizzying number of ways we can get images from a camera with a lens to a finished product that can be distributed to theaters or to our homes.

When you shot on film, processed the film, cut it together and timed the film to create a final timed interpositive you then went off to make prints from an internegative. The workflow was pretty much the same. There may have been options, push/pull processing, bleach bypass, etc., but the workflow remained at the same lab doing the processing on all of the other film.

With the move to digital intermediate, we really saw the power of computing start to make a tremendous impact on the image-crafting aspect of filmmaking. The possibilities for color and lighting were almost boundless.

Most if not all of those photochemical processes can be created digitally. But now that we have transitioned much of today's productions from film- to digital-camera capture – Sony, Arri, Red, Canon, etc. – we have a plethora of different file formats and processing tools, as well as options that can be applied at different points in the production or post-production stages. It can quickly get out of hand, if not managed properly. This is why there's such an intense focus on workflow.

And it's not necessarily new, as the 2011 Next Gen Production Workflow Report revealed the state of things at that time. But five years later, the problem has not gotten better; some might say it is worse due to the additional cameras that have been released since then, as well as the arrival of 4K Ultra HD and high dynamic range (HDR).

Workflow is a term that we often hear used but is seldom explained clearly. Workflow is something that has multiple layers: an overarching workflow from on-set to dailies to VFX and finishing, and detailed sub-workflows at each of those particular stages in order to get the correct

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result at all levels. In a nutshell, workflow is about managing color and images to ensure consistency of viewing over the entire ecosystem of production and post-production.

This is powerful for the cinematographer and director, as they cannot always be involved in every aspect of the show. It's important for content owners so that they can know they are getting the best-looking images and hopefully the most revenue from as many downstream outlets as possible. The wrong workflow can severely limit the possibilities. The right one can open up a world of possibilities previously unknown.

Today's digital cinema cameras are so sophisticated, they capture images intended to be viewed with a Look Up Table (LUT) to appear correctly on a monitor. So what the camera is capturing isn't really what you are seeing on a display. This LUT needs to be applied in processing so that dailies look correct. The same LUT needs to travel with the shot to a VFX vendor in order for that vendor to know how the shot is intended to look. That same LUT also needs to go to the DI house in order for the colorist to know what the cinematographer was seeing on the day the shot was taken. This can, and most likely will be, months later.

Now, multiply the number of different cameras being used on a single production, and the number of LUTs being used, and the number of VFX shots, and the number of different VFX vendors, and workflow becomes incredibly important. It will act as the recipe for each facility to follow as the project makes its journey to becoming a finished movie. And at any point in the chain, if the workflow isn't followed, then the shot, the scene or perhaps the entire movie won't look as intended.

As noted, there are myriad workflows one can choose from or create on a production. And no single workflow is the “correct” one, as often there are multiple ways to get there. But as the complexities around camera capture and workflow intensify, we can start to simplify production (and our lives) by embracing the Academy Color Encoding System (ACES) workflow developed by the Academy of Motion Picture Arts & Sciences (now being standardized in SMPTE – Society of Motion Picture and Television Engineers).

ACES allows for a standardized methodology for taking camera footage from just about any camera and

ensuring that the conversions for viewing are all being done correctly and are the same at all points along the production and post-production chain. This simplification allows us to retain a very-high-quality digital negative with all of the creative color decisions baked into the final result, but without the inherent limitations that come with targeting only one particular display medium (theatrical cinema projection, standard-dynamic-range television, etc.). It allows us to keep those master images for future use.

ACES ensures we have images that can be recalled in future generations to be re-cut, restored, remastered and repurposed into media that have not yet been invented, all while retaining the original creative intent of the director and cinematographer.

But just as importantly, the ACES workflow allows us to get the most usefulness out of the work actually being done today with ease and simplicity. The ACES process of using a single output display LUT means that we can change the output display LUT as the display itself changes. We can go from P3 to HDR to Rec709 simply and easily, as well as go beyond to new displays as they are being developed and come to market.

Production and post-production hardware and software vendors have also seen the light and are incorporating ACES into their toolsets. It's becoming even easier to just hit the ACES button in order to get a proper setup without having to sweat the details. (Well, maybe not that simple, but close.)

With ACES, we also have images that are ready to go into the archive. This was one of the design goals of ACES from the outset: to be able to store a standardized set of images along with open and freely available LUTs and transforms so that we can be sure that we will have these materials for generations to come.

Bill Baggelaar is Senior Vice-President of Technology for Production and Post-Production at Sony Pictures, where he has helped drive the studio's transition from tape-based video to the file-based world of Interoperable Master Format (IMF) for UltraHD and HD. Previously, Baggelaar worked at Warner Bros. Studios for 13 years in feature animation, VFX, DI and video mastering. He holds a BS in Computer Science and is a SMPTE member. 🍷