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AUGUST 2016

STAR TREK BEYOND

Double Negative Crafts
23rd Century Effects

Jason Bourne
Barry Ackroyd, BSC,
Goes Rogue On 35mm
Kodak 3-Perf

Masters Of FX
Secrets From Hollywood's
Effects Gurus

Even Keel
Next-Gen Camera
Stabilizers

Creamy Sharpness:
Leica Summilux Primes

Risky Business:
Budgeting Your Flick

Happy Birthday:
Indie On Kowas + RED 6K



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ON THE COVER:

Chris Pine as Captain James T. Kirk in *Star Trek Beyond*. Photo by Kimberly French © 2015 Paramount Pictures

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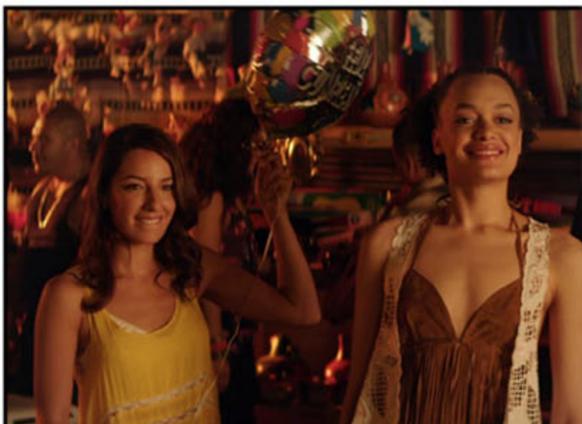


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By Valentina I. Valentini



Kimberly French © 2015 Paramount Pictures



INSIDE STORY This issue of *HDVideoPro* features effects-driven stories that examine classic gems of the past, tricks and trades of the present, and imaginary visions of the future. We begin with a look into the 23rd century with *Star Trek Beyond*, a highly anticipated sequel, with Captain Kirk at the helm once again. Principal effects vendor Double Negative takes time to discuss the wide-ranging effects seen in the film. Intriguing details are also revealed along the way, information such as the subtle redesign of the *USS Enterprise* to recall the model ship used in the original '60s TV series. Long scientific discussions over particle physics were

also on tap, as the effects team worked hard to create a new and effective way of depicting faster-than-light travel, as shown in the ship's warp speed effects.

To expand the discussion on VFX, we feature a review of the book *Masters of FX*, a well-designed volume examining the past 50 years of effects in film. The book features interviews with FX gurus behind some of the most memorable effects sequences in the history of cinema, including Steven Spielberg's *Jurassic Park*, Tim Burton's *Alice in Wonderland*, James Cameron's *Terminator 2: Judgment Day* and Ang Lee's *Life of Pi*.

And, if you didn't know it, Bourne is back: *Jason Bourne*. Matt Damon reprises



his role as the rogue agent, something he said would never happen after 2007's *The Bourne Ultimatum* unless director Paul Greengrass came back onboard. Nine years later, the stars have aligned, and the duo is back for the fifth installment of the action series. We get technical with cinematographer Barry Ackroyd, BSC, who informs us on the challenges experienced during the shoot. Discussing *Bourne*, Ackroyd reveals that 35mm film was his primary source of capture, shooting on 3-perf Super 35 Kodak film with three Aaton Penelope cameras on set. A handful of dim night scenes did require the ARRI ALEXA XT, but Ackroyd's insistence to use film during production

comes from the firm belief, held by many, that film remains the superior technical option for capture. "I don't doubt there will be a technically superior format that emerges at some point in the future," he muses. "But it isn't here yet."

Our equipment reviews include a detailed look at the Blackmagic URSA Mini, a new 4.6K camera with seemingly no downside. Meanwhile, a focused look at new stabilizer equipment breaks down the most effective gear available for you on the market today. A closer examination of the Lytro Immerge represents new disruptive technology in filmmaking—it's the world's first light-gathering camera that promises to revolutionize the virtual

reality world. This professional solution collects enough raw data to re-create scenes exactly as they took place, the first time in history that a camera has been capable of capturing the full light-field volume of a scene to rebuild later in post, where controls such as aperture, shutter angle and focus are tweaked after the footage has been shot.

Our regular columns also inform, some answering your filmmaking questions, while others glance at new, affordable equipment that you really need to examine. Until the next time, keep the passion!

—Simon Wakelin, Editor
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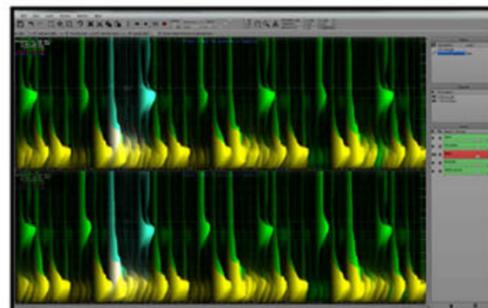


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Blackmagic URSA Mini, the lightweight Super 35 4.6K digital film camera with 15 stops of dynamic range!

URSA Mini is a lightweight digital film camera featuring an incredible 4.6K Super 35 sensor and up to a massive 15 stops of dynamic range! The lightweight and strong magnesium based design is perfectly balanced, making it comfortable for all day shooting. You also get a bright 5 inch foldout touchscreen, 12G-SDI connections and even dual CFast recorders that work in RAW or ProRes so you can change cards while recording!

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Jason Bourne

Matt Damon reprises his role as the CIA's most lethal operative in the form of *Jason Bourne*, the latest installment in the action series. The feature reunites Damon with director Paul Greengrass, previously onboard for *The Bourne Supremacy* and *The Bourne Ultimatum*. Cinematographer Barry Ackroyd, BSC, shot the majority of the spy thriller on 35mm film, using 3-perf pull-down with Aaton Penelope cameras. The only use of digital was on night scenes with ARRI ALEXA XT. Although the film was heavily storyboarded, Ackroyd's documentary background assisted in keeping a fresh flow of action to capture during the shoot, allowing him to discover elusive moments that surprise beyond the previz. The audience also finds itself locked into the story's emotional beats, as well as on its toes, with Ackroyd drawing additional inspiration from a number of iconic shooters from the '70s, including Haskell Wexler and Robert Drew.

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Star Trek Beyond

Star Trek Beyond takes us deep into the 23rd century courtesy of VFX goliath Double Negative, who handled the film's many and varied effects. DNeg is no stranger to big Hollywood features, having recently collected an Oscar® on Christopher Nolan's *Interstellar*. After completing *Godzilla* and *Exodus: Gods and Kings*, DNeg co-founder Peter Chiang came onboard to serve as overall visual effects supervisor. Meanwhile, Justin Lin captured a 35mm Panavision look with little flair and plenty of artfacting to add grittiness to the film's look. Cinematic variety became DNeg's main challenge during post, looking to go where no FX team had gone before. This led to a variety of new effects, including subtle changes to various structural designs of the *USS Enterprise* to recall the original ship from the '60s TV series. Warp speed effects were dramatically improved following extensive research—studying how light is bent by gravitational lensing, how bullets create a wake traveling through water, as well as the vapor trails of planes flying at great speed. For authenticity in space, NASA footage was scrutinized to understand how whites are blown out during genuine conditions of harsh sunlight, adding yet another layer of authenticity to the film's many breathtaking sequences.

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FOUR FOR 4K

Alongside street availability of the **AK-UC3000** 4K studio camera solution and the **VariCam LT** 4K camcorder, currently being used on productions like *Bad Santa 2* and *Orange is the New Black*, **Panasonic** has expanded its line of 4K capture offerings with the new UX series of handheld solutions. Designed as successors to the FHD 1080p AVCCAM line of pro AVCHD camcorders, two models start off the UX family—the premium **AG-UX180** with a 20x optical zoom lens and UHDp60, and the more economical **AG-UX90** with a 15x zoom lens and top frame rate of UHDp30. With an effective 1-inch MOS sensor, the UX cameras will record to SD memory cards for dual codec options alongside 3G SDI/HDMI 2.0 outputs and infrared capture in low light. FHD 1080p is planned to be available in VFR (variable frame rate) modes from 2 to 60 fps. Now available, the 4K VariCam LT cinema and documentary solution has the same Super 35mm sensor and imaging capabilities as the top-shelf VariCam 35, but with Canon EF mount and a significant reduction to the size, weight and price of its bigger brother. For B4 mount needs, the broadcast- and 4K-ready AK-UC3000 outputs a UHD signal at up to 3840/2160/59.94p. List Price: Begins at \$37,000 (AK-UC3000); \$18,000 (VariCam LT); \$3,000 (AG-UX90); \$4,000 (AG-UX180). **Contact:** Panasonic, panasonic.com/broadcast.



PRIME OPPORTUNITIES

The **ARRI/ZEISS** family of **Master Anamorphic lenses** has been joined by two new members. The **28mm MA28** has the same extremely bright T1.9 aperture as the previous seven Master Anamorphics in the line. At T2.8, the longer **180mm MA180** has the common front filter diameter of 95mm. The MA180 is optimized for use with the ARRI LDS (Lens Data System for metadata) Extender 1.4x, extending the focal length to 250mm, or to 360mm when using an also available LDS Extender 2.0x. ARRI claims that the full 2.39:1 frame and wide aperture of T1.9 is usable in any focal length at any distance with virtually no image breathing across the line, which is also color-matched to other ARRI/ZEISS primes and ARRI/Fujinon zooms. With the two new lenses, the matched Master Anamorphic range of lenses now extends to nine prime lenses and a zoom, the Anamorphic Ultra Wide Zoom AUWZ 19-36/T4.2. Developed for flattering skin tone reproduction, precise color rendition, high contrast and smooth focus fall-off, these high-performance cine lenses have a characteristic oval shape to the bokeh thanks to a 15-blade aperture. List Price: TBD. **Contact:** ARRI, arri.com.

STREAM LINE

JVC is breaking new ground with the **GY-HM660**, the first streaming camcorder to feature an internal IFB (Interruptible foldback) return audio channel, which allows one-way communication from a director to a camera operator or on-air talent. Suitable as an ENG, documentary, location or sporting and events solution, the mobile news camera with a 23x wide-angle lens (29-667mm/35mm equivalent) is small and light. With a 1/3-inch, 12-bit CMOS sensor, multiple encoding formats of up to 1080p/60 in 50 Mbps H.264 are provided to split footage between two SDXC/SDHC memory cards and live-stream when connected to a 4G LTE modem or hotspot. The streaming engine employs Zixi and SMPTE 2022 FEC (Forward error correction), ARQ (Automatic repeat request) and adaptive bit-rates for quality control of the broadcast. Low-light performance measures at a very high $f/12$ sensitivity at 2000 lux. It can also be used to deliver an RTMP stream for live-streaming services like Ustream and YouTube. FTP upload of captured files will work in the background during video capture. Concurrently, the lower-priced **GY-HM620** was announced with the same features sans integrated IFB. List Price: \$5,495 (GY-HM660); \$3,195 (GY-HM620). **Contact:** JVC, pro.jvc.com.



SEEING DOUBLE

Blackmagic Design has announced two new monitoring systems. The **Video Assist 4K** is a touch-screen 7-inch, 1920x1200 monitor and video recorder with a built-in speaker and 135° viewing angle, accommodating any SDI or HDMI camera systems, like DSLRs. Capable of recording Ultra HD in either Apple ProRes or Avid DNxHD formats at up to 2160p30 in 10-bit, 4:2:2-quality files, captured video is compatible with most NLE systems, including DaVinci Resolve, which comes standard with purchase of many Blackmagic cameras. Alongside 12V DC input and two LP-E6 battery slots for power, there are hot-swappable dual SD card slots and two XLR mic inputs with 48V phantom to use professional microphones with the Video Assist 4K, which eliminates the need for AV sync in post. The **URSA Studio Viewfinder** is sized specifically for the URSA Mini camera, providing variable tension mounting points, viewfinder handles and an attachment arm that allows articulation of the camera while holding screen. With customizable external controls over settings like zoom, false color, edge focus, 3D LUT and more, the URSA Studio Viewfinder is designed to convert URSA Mini cameras into an ideal multi-cam solution for live events and television studio situations. Each 7-inch URSA Studio Viewfinder has an RGB tally light with oversized clip-on numbering system that will light red for on-air notification and orange for ISO (isolated) capture with multiple camera video feeds. A B4 mount version is available to adapt broadcast HD lenses with full lens control to the URSA Mini PL, as well. List Price: \$1,795 (URSA Studio Viewfinder); \$895 (Video Assist 4K). **Contact:** Blackmagic Design, blackmagicdesign.com.



RACK 'EM UP

Available in 48 TB, 72 TB, 96 TB and 120 TB capacities, the sleek and stylish **G-RACK 12** NAS (Network-Attached Storage) rack from **G-Technology** provides a centralized, high-performance video-holding system for small- to medium-sized production houses and studios. Featuring integration with most popular editing software suites like Adobe Premiere Pro, Apple Final Cut Pro X and Avid Media Composer, the 12-bay 120 TB server can expand up to an additional 120 TB through the optional G-RACK 12 EXP Expansion Chassis units. The 3.5-inch HGST Enterprise drives and Dual Intel Xeon E5 Haswell V3 6-Core processing with four 10 GbE connections offer a data transfer of up to 2000 MB/s. Rare in the rack-server space, it's nice to see attention being paid to external design as much as to internal specs. List Price: Begins at \$16,999. **Contact:** G-Technology, g-technology.com.

INSTANT MAGNIFICATION

Compatible with Leica Summilux-C and Summicron-C, and ARRI Master Anamorphic, Ultra Prime and Ultra 16 lenses, as well as the 28-80mm and 70-200mm ZEISS Compact Zooms, the **Leica Cine MacroLux +1 diopter** from **CW Sonderoptic** is a stackable front-end magnification lens that will enhance macro shots and tighten the field of view of a lens for a slight telephoto feel. For macro, the minimum focal distance of the lens is decreased, the MacroLux effect, which magnifies the image size relative to the sensor dimensions. This becomes more pronounced the longer the lens. The Leica Cine MacroLux +1 also enhances background separation while accentuating the natural bokeh elements and focus falloff to infinity. The characteristics of the optic are designed to closely match the look of the Leica Summilux-C and Summicron-C lenses, which are reviewed in this issue. Minimum focusing distance even can be converted. When using a single optic with the 135mm Summicron-C lens, the minimum focus distance is reduced from 5' to 2' 6", for example, while the 100mm and 75mm Summicron-C models are each reduced from nearly 3' each to only 2'. With a 95mm front diameter, CW Sonderoptic claims no light loss, spherical aberrations, color or centering issues. A double-screw system tightens it all down. List Price: TBD. **Contact:** CW Sonderoptic, cw-sonderoptic.com.





A SMALL OVERHEAD

Available as a **Standard Light Boom (#3800)** or a **Compact Light Boom (#3810)**, Chimera Lighting, who makes professional light-banks and lighting accessories, has released new models in a range of lighting booms that are designed with a handle and scaled articulation system for precisely setting the angle of adjustment. Both versions of the Light Boom have a sliding counterweight system for use with larger softboxes or other lighting modification systems. With sliding counterweight and self-arresting movement, the design of the boom arm makes it very comfortable and easy to move, even in tighter studios. The head extension is capable of 360° of rotation for a high degree of directional control over lighting angles, and the whole assembly can be put together within five minutes without the need for tools. The Standard Light Boom is also available as the **Chimera Pancake Lantern and Standard Light Boom Kit (#1840)** with Triolet and Chimera Pancake Lantern, which is a soft overhead source. List Price: \$1,650 (Lantern and Standard Light Boom Kit #1840); \$700 (Standard Light Boom #3800); \$550 (Compact Light Boom #3810). **Contact:** Chimera Lighting, chimeralighting.com.

Spoiler Alert!

Kino Flo's new **Select** LED spoils you with an array of features, including variable color temperature (from 2700K to 6500K), tunable green-magenta hues, wireless DMX, and a detachable controller to operate the lightweight fixture remotely. Select LED – a choice light for location and studio.

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STUDIO MONITORS

Two 1920x1080 studio production monitors, the 24-inch **2403L Studio** and the 17-inch **1703L Studio**, are offered by **SmallHD** as more affordable versions of the daylight-viewable, HDR-capable 2403HDR and 1703HDR monitors announced just this last April at NAB. Designed for work in controlled lighting environments like shooting studios or video villages rather than direct sunlight, at 250 nit brightness, the monitors are roughly a quarter as bright as the HDR production monitors, so they're not capable of HDR preview, but otherwise they have the same features as their much more expensive counterparts, including a user-replaceable 3mm thick polycarbonate screen protector and the same 3D LUT support and internal modes. With one HDMI and two SDI inputs, each one also has a loop output for connecting other gear down the line without the need for an additional splitter. The monitors include SmallHD's innovative RapidRail shoe-mount system that allows cold-shoe attachment devices like wireless systems to be quickly slid on and locked down to the backside of the unit. The aluminum housing also has an internal C-stand mount, XLR power input, 12v Lemo power-out, three USB 2.0 ports and durable top handle for portability. Separately available V-mount or Gold-mount battery plates can be used. List Price: \$3,499 (2403L Studio); \$2,999 (1703L Studio). **Contact:** SmallHD, smallhd.com.

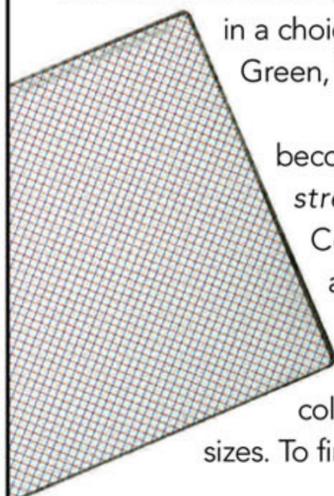


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The Stars join the True-Streak family that's become popular for creating that *anamorphic streak effect*. For another dynamic look, Confetti filters create mini-streaks that appear as a sparkle or fireworks effect as the filter is rotated or lights move in the image. Plus there's more—in multiple colors and strengths and popular professional sizes. To find just the effect you are looking for visit:

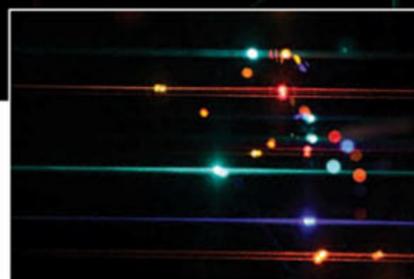


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FILTERED RESULTS

The **1-Stop Circular Polarizer** from **Schneider Optics** is the first filter solution in a new line of front-of-the-lens models for professional cinematography. Claiming only a single stop of light loss and polarizer efficiency far exceeding linear polarizers, the 1-Stop Circular Polarizer minimizes glare and reflections while removing haze to saturate colors and skies. It's available in popular sizes like 4x4, 4x5.65 and 6.6x6.6, as well as customizable dimensions. Available in standard video and cinema sizes, Schneider has also released a new high-strength 8-stop 2.4 IRND filter that joins their family of IRND optics to reduce infrared spillage on the camera sensor. This extends color gamut and maintains color rendition in blacks, helping to maintain the MTF (modulation transfer function) results of the lens as they project to the sensor. The company's True-Streak effects line of star-point filters has been expanded, too, with 4-, 6- or 8-point refraction points in a variety of available color patterns. List Price: TBD. **Contact:** Schneider Optics, schneideroptics.com.

WHAT A DRAG!

As an eighth-generation design, **Benro** has updated the heavy-duty **BV4 Pro** and **BV6 Pro Video tripod kits** for precise control over panning, tilting, drag and counterbalance. At up to 8.8 pounds on the BV4 and 13.2 pounds on the BV6, both two-stage, 3-section aluminum tripod solutions feature an ergonomic, oversized dial at the base with numbered levels of counterbalance for dialing in the right amount of weight when working with longer lenses and heavier systems. The BV4 offers six steps of counterbalance, from 0 to 5, while the BV6 literally steps up the offerings to eight steps at 0 to 7. There are also four steps of independent pan and tilt drag, plus a tilt range of +90°/-60°. Both systems include a 501/504PL-compatible QR13 quick-release plate and carrying case. Featuring a metal 75mm bowl, the adjustable double-tandem leg has a removable spreader. Estimated Street Price: \$559 (BV6); \$439 (BV4). **Contact:** Benro, benrousa.com.



ROCK AND ROLL

A new line of seven durable **Think Tank Photo** video bags provides run-and-gun solutions for documentary and ENG operators or live-event shooters who often need to be able to shoot right out of the bag. The large-capacity storage solutions are big enough to carry a fully assembled camcorder system so they can be stored as-is between shoots. The oversized bags are light and soft-sided, in comparison to heavier hardshell cases, which saves on weight and shipping. The **Video Rig 24 rolling case**, for example, will hold a complete setup at 24 inches in length, which will accommodate systems like the Canon Cinema EOS series, the Sony FS700, FS5, FS7, F5 or F55, the RED EPIC or SCARLET, as well as Blackmagic's Cinema cameras, URSA or URSA Mini, the AJA Cion, the ARRI ALEXA and many other ENG cameras. The **Video Transport 20**, a mid-range version, will hold a camcorder, four to six lenses and accessories. The smallest bag currently in the line, the **Video Workhorse 19** shoulder bag, is capable of holding up to a 19-inch camera. There are four other bags in the line at varying dimensions and price points—the **Video Rig 18**, **Video Transport 18**, **Video Workhorse 21** and **Video Workhorse 25**. List Price: Begins at \$229. **Contact:** Think Tank Photo, thinktankphoto.com.





SYSTEM HOLDUPS

ikan has released a new line of gimbal-based stabilization systems that can support handheld cameras of any size. With quick and fast setup and a 3-axis gyro-stabilized brushless motor, the **Beholder Gimbal MS1** is aimed at mirrorless solutions with weights of up to 1.9 pounds. Capable of supporting up to 3.7 pounds, the next model in the line, the **Beholder Gimbal DS1**, can even out footage for midweight camera video solutions like DSLRs. For professional camcorder systems and load capacities of up to 6.6 pounds, the **WenPod MD2** is the most advanced support in the line. ikan also has released the smaller **FLY-X3-PLUS gyro units** for smartphones and action cams like GoPro models, as well as the **FLY-X3-GO**, which is specifically stabilized for GoPros right out of the box. Estimated Street Price: Begins at \$199. **Contact:** ikan Corp., ikancorp.com.

WAX ON, WAX OFF

K-Tek is selling its "secret formula" **Boomshine** cleaning and waxing agent. For 20 years, the company has manufactured microphone boom poles since the original and lightweight K-Tek Klassic, still on sale now. Complementing Klassic K-Tek poles and K-Tek models made from Avalon Aluminum or Graphite, as well as boom and audio pole solutions from other brands, each 4-ounce bottle of Boomshine comes with two microfiber cloth chamois. List Price: \$20. **Contact:** K-Tek, ktekpro.com.



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Pro Editing And Recording At Bargain Pricing

Sony SpectraLayers Pro for sound editing, plus the Sennheiser AVX wireless audio system

By Dan Brockett

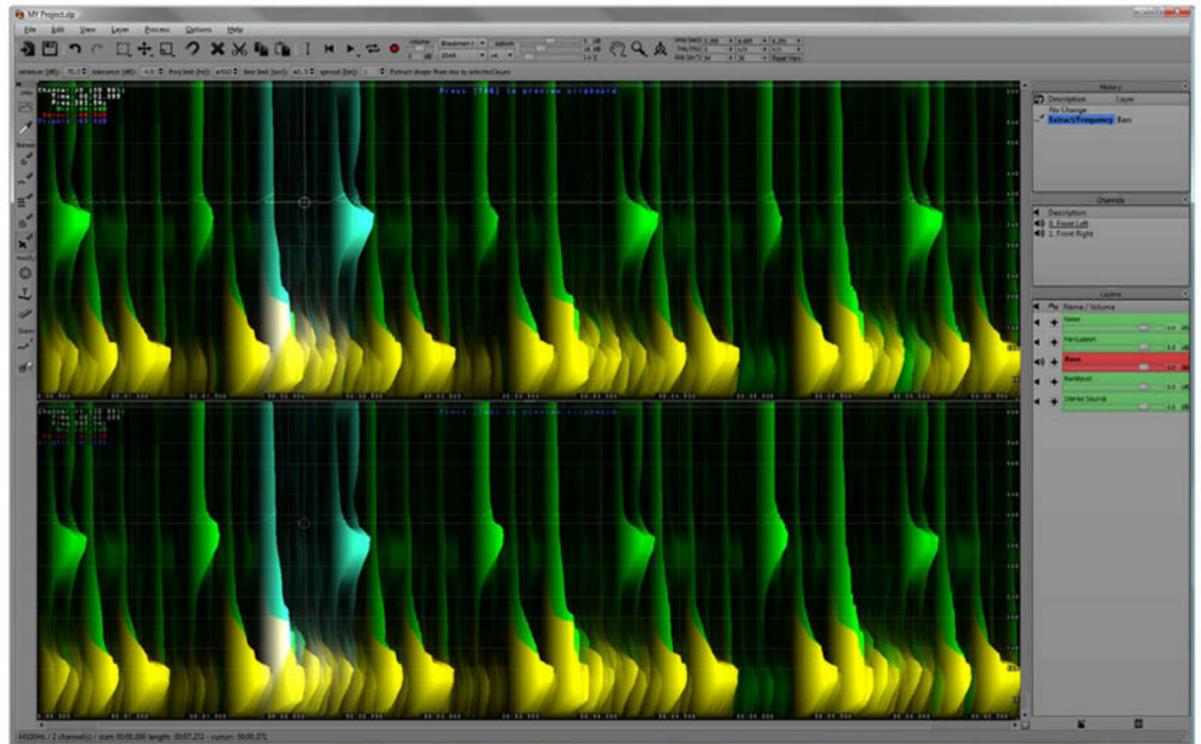
AUDIO EDITING ON A BUDGET

I've been looking for a better way of tweaking and processing my audio. I mostly shoot live events, weddings and corporate projects, where there's occasional background noise that I'd like to remove, sounds like excess echo or reverb from an announcer speaking in a lecture hall with a lot of reflective surfaces besides just the stage. I've looked at Pro Tools and Sound Forge, as well as other plug-in packages on the market and, frankly, I'm overwhelmed. I'm definitely more of a video editor. I use After Effects and Photoshop in a lot of my work, so much of the terminology and clutter of the audio tools feels intimidating, but I'd like to experiment with some audio tools without spending a fortune or purchasing software that has pro-level complexity. Any suggestions?

Al D.
Via email

It's not quite clear to me if you're looking for a multi-track editor or looking for an interface to experiment with various plug-ins. Many of the more popular audio tools not only will work as plug-ins for popular audio editors like Pro Tools, they also will function as standalone programs. Since you seem to be more of a visual learner who wants to venture into audio, you might consider a software package like SpectraLayers Pro by Sony.

In SpectraLayers Pro, you can work with the individual sounds in an audio file just as if they were objects in a photograph. It's almost the same as using layers in After Effects or Photoshop. The software lets you do detailed repairs with a lot of precision. In regard to the audio challenges you sometimes face, SpectraLayers lets you reduce the



ABOVE: Sony's versatile SpectraLayers Pro audio-correction software with graphical interface for adjustments.

noise and increase audio clarity, but the program also allows you to transform a sound picture into something new and different. The spectral editing experience is a pretty interesting way to edit audio and goes way past the basic audio waveform you see and use in other programs.

I've been experimenting with SpectraLayers Pro, and it's very effective, as well as pretty fun to try different types of nondestructive edits, making it perfect for experimentation. I was able to significantly reduce beeps from someone's cell phone and basically eliminate a wood chipper in the distance during an interview.

SpectraLayers Pro shares some functionality with other audio-editing software and plug-ins like iZotope RX 5 (discussed in the April 2016 issue of HDVP), but it has enough unique qualities over iZotope to make it worthy of your consideration—if you want to experiment. iZotope is geared more

toward repairing poor-quality audio, whereas SpectraLayers is capable of that, but also can be used creatively to experiment with your audio.

Here's Sony SpectraLayers Pro in broad strokes:

- Noise reduction: Perform print-based noise reduction using customized noise prints containing multiple frequency bands of any width.
- Precise repairs: Remove unwanted noises and artifacts with ease while leaving surrounding audio data completely intact.
- Isolate events: Separate music and dialogue into individual component layers.
- Pitch correction: Perform pitch correction on user-selected components of an audio file.
- Remix audio: Divide audio into component parts for processing and remixing.

The program is available for Mac and Windows, and retails for \$399.95. You



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can download a free trial version, so give it a spin and see what you think: sonycreativesoftware.com/spectralayerspro.

RECORDING QUALITY PLUS SIMPLICITY IN A SINGLE PACKAGE

I work with a production company as a sound mixer, shooting several types of projects including shorts, EPK and BTS content, plus videos for a large software company's YouTube channel. I currently own two of the Sennheiser evolution G3 wireless systems. Overall, I've been pretty happy with them, but they're pains to scan for clear bandwidth if we're getting audio hits in different locations. I've looked at the RØDE RØDELINK wireless systems, and I find the simplicity appealing, but unfortunately, the transmitter is too large. I can't afford high-end wireless like Lectrosonics. What else might I want to take a look at?

John B.
Via email

Since you seem to be happy with the performance you've been getting with your Sennheiser G3 systems overall, I'd suggest you check out the Sennheiser AVX system (sennheiser.com/avx). The AVX system aims to solve the frequency issue by automatically and seamlessly switching to another frequency whenever interference is encountered. Because the system operates in the license-free 1.9 GHz band, the crowded UHF frequency bandwidth issues that you may encounter in crowded urban areas mostly becomes a non-issue.

Functionally, compared to the G3 system, this system is truly plug-and-play—no need to adjust frequencies while the rest of the crew is waiting, no worries about interference—just plug in the receiver (it powers on automatically when you power on your camera), power on the transmitter, and go. The AVX system is similar in operation to the RØDE system, but as you alluded to, the transmitter on the RØDE is rather large. The transmitter on the AVX system is ridiculously small in comparison; it's really just a male XLR connection with a tiny body and a short, fixed antenna.

While I didn't have a chance to really put a friend's AVX system through all of



ABOVE: Sennheiser's advanced, but affordable wireless AVX system with lavalier, handheld transmitter and receiver.

the paces I'd typically encounter on location shoots, I was able to verify that the AVX system sounds better than the already decent-sounding Sennheiser G3 system. The range is excellent. I was able to receive clean, clear sound up to about 100 feet—even through walls in a hotel. The AVX system is digital and has 19ms of latency, so if you're monitoring the output of your camera through headphones, it takes a while to get used to the slight delay you'll hear, but as far as recording and sync, 19ms is a non-issue.

The Sennheiser AVX system is available with a belt-pack transmitter that's compatible with a large array of lavalier microphones with 3.5mm jack audio outputs or with a handheld dynamic mic for news reporting or live TV situations. Sennheiser chose to completely rethink the established wireless system form factor; this system is small and light, and has great sound. Using it is much simpler than high-end professional systems, but the

results are also very good, with better specs and sound than the popular G3 systems.

The Sennheiser AVX wireless audio systems range in cost from \$899 to \$1,299 for a set that comes with both the lavalier transmitter and the handheld dynamic mic transmitter. For the quality the system has, these are very reasonable costs when you consider that a comparable system from high-end vendors costs over \$3,000. It would be worth your time to evaluate the AVX system.

HDVP
16 CFR Part 255 Disclosure: Neither Sony nor Sennheiser compensated me to write this article. Sony didn't send me a review unit to try out the software; I purchased my own copy of SpectraLayers Pro audio editor from Sony at full retail cost. I borrowed a colleague's Sennheiser AVX system for evaluation. No material connection exists between the manufacturers mentioned in the article and myself.

To have audio questions answered, send an email to audioassist@hdvideopro.com.

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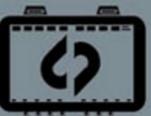


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Risky Business: Financing Your Feature Film

Part Two on how to score film financing, with a detailed examination of equity investments, financing from producers and soft money

By Mark Litwak, Esq.

In the last issue, we covered some of the most important ways to finance a feature film. To wrap up, let's take a look at the remaining options, namely equity investments, financing from producers and soft money.

EQUITY INVESTMENTS

With equity investments, an investor shares in potential rewards, as well as the risks of failure. If a movie is a hit, the investor is entitled to receive his investment back and share in proceeds, as well. Of course, if the movie is a flop, the investor may lose his entire investment. The producer isn't obligated to repay an investor his loss.

An equity investment can be structured in a number of ways. For example, an investor could be a stockholder in a corporation, a non-managing member of a Limited Liability Company (LLC) or a limited partner in a partnership.

The interests of individuals and companies that don't manage the enterprise they invest in are known as securities. These investors may be described using a variety of terms including silent partners, limited partners, passive investors and stockholders. They're putting money into a business that they're not managing (i.e., not running).

State and federal securities laws are designed to protect such investors by



ensuring that the people managing the business (e.g., the managing members of an LLC, general partners of a partnership, or the officers and directors of a corporation) don't defraud investors by giving them false or misleading information, or by failing to disclose information that a reasonably prudent investor would want to know.

In a limited partnership agreement, for example, investors (limited partners) put up the money needed to produce a film. Investors usually desire limited liability. That is, they don't want to be financially responsible for any cost overruns or liability that might arise if, for instance, a stunt person is injured. They want their potential loss limited to their investment.

Because limited partnership interests are considered securities, they're subject to state and federal securities laws. These laws are complex and have strict requirements. A single technical violation can

subject general partners to liability. Therefore, it's important that filmmakers retain an attorney with experience in securities work and familiarity with the entertainment industry. This is one area that filmmakers shouldn't attempt on their own.

The federal agency charged with protecting investors is the U.S. Securities and Exchange Commission (SEC). Various state and federal laws require that most securities be registered with state governments and/or the SEC. Registration for a public offering is time-consuming and expensive, and not a realistic alternative for most low-budget filmmakers.

Filmmakers can avoid the expense of registration if they qualify for one or more statutory exemptions. These exemptions generally are restricted to private placements, which entail approaching people one already knows (i.e., the parties have a preexisting relationship).

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THE BUSINESS OF FILMMAKING

Compare a private placement with a public offering where offers can be made to strangers, such as soliciting the public at large through advertising. Generally, a public offering can only be made after the SEC has reviewed and approved it.

There are a variety of exemptions to federal registration. For example, there's an exemption for intrastate offerings limited to investors all of whom reside within one state. To qualify for the intrastate offering exemption, a company must be incorporated in the state where it's offering the securities and it must carry out a significant amount of its business in that state. There's no fixed limit on the size of the offering or the number of purchasers. Relying solely on this exemption can be risky, however, because if an offer is made to a single non-resident, the exemption could be lost.

State registration can be avoided by complying with the requirements for limited offering exemptions under state law. These laws are often referred to as "Blue Sky" laws. They were enacted after the stock market crash that occurred during the Great Depression. They're designed to protect investors from being duped into buying securities that are worthless—backed by nothing more than the blue sky.

The above-mentioned federal and state exemptions may restrict offerors in several ways. Sales are typically limited to 35 non-accredited investors, the investors may need to have a preexisting relationship with the issuer (or hold investment sophistication adequate to understand the transaction), the purchasers can't purchase for resale, and advertising or general solicitation generally isn't permitted. There's usually no numerical limit on the number of accredited investors.

All security offerings, even those exempt from registration under Regulation D, are subject to the antifraud provisions of the federal securities laws and any applicable state anti-fraud provisions. Consequently, the offeror will be responsible for any false or misleading statements, whether oral or written. Those who violate the law can be pursued both criminally and civilly. Moreover, an investor who has purchased a security on the

basis of misleading information or the omission of relevant information can rescind the investment agreement and obtain a refund of his investment.

In 2012, President Obama signed the JOBS (Jumpstart Our Business Startups) Act, a collection of laws that relaxes regulations on capital raising for startup companies and has provisions that for the first time allow Internet crowdfunding of small businesses, such as producing indie films. Although existing companies like Kickstarter allow filmmakers to raise funding from donations, this new law allows filmmakers to raise up to \$1 million in equity investments by soliciting the general public without complying with the onerous security regulations mentioned above.

Crowdfunding refers to the process of raising money to fund a project or business through numerous small donors, often using an online platform or funding portal to solicit their investment. Because investing in films is such a risky endeavor, being able to spread that risk among many small investors may substantially increase the amount of financing available for indie films.

Essentially, the new rules allow companies like Kickstarter and Indiegogo to offer those who contribute funds to receive more than swag. For the first time, promoters are also able to offer a share of the profits in a project.

FINANCING FROM PRODUCERS, NETWORKS OR STUDIOS

Producers often finance their films and series from the companies that intend to distribute them. If you can make a deal for your project with HBO, Netflix, Amazon or any number of other networks and channels, they may be willing to provide 100% of the production budget. The producer receives a fee (10% to 15% of the budget) for her services and may share in profits. Usually, the network or channel owns the completed project and can distribute it as it likes. This option usually isn't available to newcomers without a track record of successful production.

SOFT MONEY

Soft money refers to tax credits and incentives, co-productions and subsidies.

Not all incentives are available to Americans. Some international subsidies are designed to assist local moviemakers and promote indigenous culture. In fact, many countries feel their cinema has been overwhelmed by a vast influx of American films, and the only way their moviemakers can compete is with some government assistance.

Location-based rebates are given to producers based on the amount they spend in an area. While the benefit may not be paid until after completion of the production, certain banks may loan the producer funds with the anticipated benefit as collateral. Some incentive programs seek to support filmmaking by encouraging investors.

To be eligible for some international incentives, the film may need to employ cast members from certain countries. It's not unusual for an American producer to shoot abroad and bring along one or two American stars to enhance the value of the film. While the United States isn't a party to any international co-production treaties, our filmmakers can contract with a local co-production partner that may have the savvy and relationships needed to secure the best deals and ensure compliance with local regulations. Moreover, an American movie that includes a local director or star may enhance the commercial appeal of the film in that country, increasing the license fee obtainable.

Approximately 39 states and Puerto Rico offer incentives. Incentives are often used in combination with other financing. They might contribute 25% or more of the production budget, but usually nowhere close to the entire budget. HDVP

Mark Litwak is a veteran entertainment attorney and producer's rep based in Beverly Hills. He's the author of six books, including "Dealmaking in the Film & Television Industry," "Contracts for the Film & Television Industry" and "Risky Business: Financing & Distributing Independent Films." He's an adjunct professor at the USC Gould School of Law and creator of Entertainment LawResources. You can reach Mark at law2@marklitwak.com, or you can visit his website at marklitwak.com.

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Cinema Quality HANDHELD DESIGN

The Blackmagic URSA Mini 4.6K offers 15 stops of dynamic range on a Super 35 sensor, plus 60 fps of RAW 4K-quality footage. In a word, it's impressive.

BY JIMMY MATLOSZ



Blackmagic Design has been a player in the video scene since the early 1980s, acquiring DaVinci Systems in 2009 before entering the digital cinema market a few years ago. The company's latest camera is the URSA Mini 4.6K, an incredibly versatile unit capturing up to 60 fps in CineDNG RAW on a Super 35-sized sensor.

My first impression of the URSA Mini? Impressive. It looks and feels like a real cinema camera. Its body has a slick ergonomic feel and style, possessing a rugged exoskeleton made of magnesium alloy, with plenty of ventilation, solid support and pick points. The sleek, lightweight camera is designed for real-world applications. The lens-mount options are Canon EF or Cinema PL, as well as B4. I chose the PL-mount version that turned out to be very solid and well designed, integrating seamlessly into the camera body.

RAW non-compressed files captured on the camera's 4608x2592-pixel sensor are massive, an estimated 10.5 MB in size per frame. As a result, applications for the camera can go way beyond simply making pretty pictures, making it useful for a plethora of detailed VFX work.

My original thought was to shoot in the camera's highest resolution, but I quickly realized it was more than my home editing system could handle. It should be noted, however, that even though the file sizes were daunting, they easily imported into both Adobe Premiere and Blackmagic's DaVinci Resolve. All was ready for down-res or transcoding to any number of optional post formats with ease.



The Blackmagic URSA Mini 4.6K is a lightweight camera designed with handheld ergonomics in mind. Images captured during tests proved to be rich and organic, with plenty of latitude. Blackmagic's latest camera is an excellent choice for film, reportage and documentary filmmakers.

On the backside of the camera comes an integrated V-mount battery plate that feels like a true extension of the unit. What I really liked was the rosette mount on the camera's side, allowing for a side grip that was strong enough to support the full weight of the URSA Mini. It's also outfitted with a record button, plus iris and focus buttons for use with ENG-style lenses.

The camera comes with a built-in 5-inch monitor that flips out from the body, with buttons on the backside for record, playback, iris and focus. Two other assignable buttons are also available when the door is closed.

I thought I'd never use or even like a flip-out-style monitor on a professional camera, but after a few days, I found it very useful. The quality and the images displayed were superb.

The touch screen and the subsequent menus make this camera very cool. I'm not sure I've ever used a simpler menu system on any other camera in my career. It's as simple as using an iPhone, but not so simplistic that it lacks sophistication. Simply stated, the camera has a very

friendly touch-screen interface that's fast and easy to navigate, and that leaves you to do your job without fussing over menu locations. Any professional could easily pick up and run this camera system with absolute confidence in a matter of minutes.

SHOOTING WITH THE URSA MINI

For tests, I chose to reduce resolution to 3840x2160 and shoot multiple codecs from 444 HQ to 422 ProRes, plus HD resolution for windowed shots ramped to 120 fps to capture sparks from a grinder.

The camera records to two onboard CFast cards, either independently or simultaneously. I thought the simultaneous recording option was a very smart feature, as even though it burns more data, it offers a nice redundancy for any shooter, with instant backup of valuable footage.

I shot with Zeiss Super Speeds (courtesy of CamTec), but switched to Leica Summicron primes (courtesy of Leica) and ran the camera through some varied lighting situations. This included sunset at the beach, night scenes



Accessories available for the Blackmagic URSA Mini 4.6K include a Shoulder Mount Kit, allowing for comfortable balance of the camera on the shoulder, a 1920x1080 OLED viewfinder, featuring precision glass optics that proved to be exceptional, and a B4 Lens Mount to support the use of broadcast ENG lenses.



at the Santa Monica Pier and documenting welding in a factory to catch sparks and other bright details.

The first thing I noticed was that the highlights rolled off nicely into overexposure with no obvious artifacting. Black levels seemed better in the lower ISO settings (as one would expect, as the camera is native ISO 800 with optional settings to a low of 200 and a high of 1600), but overall sensitivity in these settings was impressive. I tested between ISO 200-1600

at the pier at night and felt that ISO 200 was the preferred look. A test made in downtown Los Angeles at night garnered a favorable look at ISO 400.

Shooting skin tones, I was pleased with the results, as well. A natural true-to-eye look was apparent, even in a mixed daylight and tungsten interior scene. The camera performed flawlessly in every situation. Power up and power down were also fast and simple, while swapping recording formats was quick.

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Overall operation was smooth, and the camera felt as intuitive as any one of my well-worn DSLRs. It has a nice weight distribution—just heavy enough to be solid, yet light enough to carry. Its ergonomics are also practical and thoughtfully designed.

I really liked using the viewfinder during tests, offering adjustments for right- and left-eye-dominant operators, friction adjustment for tilting, and a diopter that was smooth and easy to adjust. The fore aft adjustment with a dovetail plate that slides nicely under the top-carrying handle is a neat touch.

Playback from the camera performed well, but one should note that the camera must be in the same settings as the acquired footage in order to play back.

The PL-mount version has a price tag of \$5,495, while the EF-mount version comes in at \$4,995. The viewfinder is an additional \$1,495, the shoulder kit, \$395, and the V-mount battery plate, \$95.

In the end, I attempted to find situations where I thought the camera wouldn't perform well, but came away with none. I'm amazed at how far, and how quickly, digital cinema cameras have advanced in recent years, and the URSA Mini, dare I say it, feels like a game changer. Could it be the start of a new generation of game-changing digital cameras? We shall see. HDVP

Learn more about the URSA Mini 4.6K at blackmagicdesign.com. Jimmy Matlosz is a cinematographer, director, writer and photographer, and the Chairman of the Emerging Cinematographer Awards. Though an Idaho resident, he often can be seen cranking up hills in Los Angeles on his bicycle in between gigs.

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KEEPING THE BALANCE

With camera stabilization becoming more affordable for filmmakers, we examine the options for cinematographers seeking support for both light and heavier-weighted cameras

BY JIMMY MATLOSZ

New stabilizer technology allows filmmakers to set up and capture just about any shot they desire. Here, a Jeep is outfitted with Freefly Systems equipment to stabilize two RED cameras, each mounted on cinema vibration isolators by Stratus Productions. The spinning Revolver Rig on top of the Jeep is especially useful with its extensive range of movement.





All Photos Courtesy of Eric Ulbrich & Phil Miller

LET'S FACE IT: Stabilizers are cool gadgets, allowing smooth movement for cameras in a wide variety of challenging situations. But mechanical and motorized stabilizers were once very difficult and cumbersome to use, with supports regulated to aerial mounts with gyroscopes and large egg-shaped orbs requiring their own separate power supply. These types of options were initially a military surplus item that, when powered, would wind up like a whirling top until they attained top speed. Sometimes they also didn't work, requiring a handy backup. Truth be told, all they really did was dampen vibration and control erratic movement by fighting the operator, or the pilot, from moving the camera too quickly.

Smarter and more advanced stabilizers have since made it to the marketplace. All are designed to remove shake and vibration to achieve smooth pans and tilts while fighting elements including vibrations caused by telescoping cranes, jib arms, bumps in the road and air resistance when traveling rapidly on a vehicle, plane or helicopter.

Technological advancement was first seen in smaller, micro gyros on mobile phones, video games and remote-control toys. This development kick-started the modern movement of stabilization units that now feature an interactive gimbal with a micro gyro, a design opening up a whole new dimension of steadiness.

Today, Freefly Systems ([facebook.com/flyspeedcamera](https://www.facebook.com/flyspeedcamera)) and DJI ([dji.com](https://www.dji.com)) are two highly touted technological companies offering quality stabilizers for different weighted cameras. Freefly first introduced their MōVI M10 in 2014, releasing a micro-gyrostabilized gimbal designed to hold anything from HD SLRs to smaller cinema cameras.

Micro-gyros work on a feedback loop relative to the unit and the attached camera. A feedback loop is also created with an additional unit that maintains horizon by way of GPS. Once calibrated, the motors know exactly how much the camera has

BELOW: Whatever your budget, you'll discover that the DJI Ronin is an essential tool in just about any situation. Even directing maestro J.J. Abrams uses the Ronin on set. BOTTOM: The Fig Rig is an aptly named device that was originally designed by director Mike Figgis for easy, handheld camera operation. The setup pictured here demonstrates how the rig can be easily attached to an actor, fully stabilized and comfortable enough for the capture of unique POV shots.



Michael Shaun, DJI





INTRODUCING THE NEW RONIN-MX



COMPLETE INTEGRATION ENGINEERED FOR PROFESSIONALS TO CAPTURE ABOVE AND BEYOND



RONIN-MX
\$1,599.00

The Ronin-MX has been designed to carry an array of cameras used on professional film sets worldwide.

Engineered to resist high G-forces using powerful motors and IMUs, the Ronin-MX maintains stability and holds horizon to ensure smooth movement in every configuration.

It offers continuous 360° rotation when mounted to aircraft/vehicles, further enhanced by an increase in tilt axis range from 90° straight down and beyond to 135°, opening up more creative options.



MATRICE 600
\$4,599.00

The Matrice 600 (M600) is DJI's newest flying platform for professional or industrial uses. It tightly integrates a host of new DJI technologies including the A3 flight controller, Lightbridge 2 transmission system, Intelligent Batteries and Battery Management system for maximum performance and rapid setup.

With a max payload of 13 lbs, its dust-proof propulsion system simplifies maintenance while active-cooling motors make for reliable operation during extended flight.



ZENMUSE X5 RAW
\$3,599.00

The revolutionary Zenmuse X5 Raw is the world's first Micro Four Thirds aerial camera capable of recording lossless 4K videos in Cinema DNG (RAW) at 24-30fps.

Engineered for professional aerial photography and cinematography, the X5R gives the freedom to choose your lens utilizing the standard MFT mount.

Paired with the M600, an extended flight time of 30 minutes empowers you to shoot and capture images like never before.



moved from its home position, thereby adjusting for various tilt, pan and roll changes. As a result, it makes a smooth concerted effort to keep the camera in the center of your gimbal no matter where you point it.

The motors do have limitations in speed and feedback, so jerking, whipping and erratic movement may result in unexpected and less than desirable results. This is due to the gyros and motors not reacting fast enough to keep up. Just remember that these stabilizers aren't magic wands and won't defy the laws of physics.

Stabilizers aren't plug-and-play, either, any more than a camera will shoot your project on its own or your computer will write your script. Stabilizers require homework and research, a bit of education and some valuable time in prep. For best results, careful calibration is essential.

Freefly Systems also offers the MōVI M5, a unit with a smaller footprint for a maximum payload of 5 pounds. The MōVI M10 is the next size up, offering a payload of 12 pounds, while the robust MōVI M15 offers a larger payload of 15 pounds. All three gimbals do the same job, each offering an application for size-relative cameras.

Additionally, Freefly Systems possesses a stellar customer support record, staffed with knowledgeable users and qualified technicians to answer all Freefly and gimbal-related questions.

DJI, top-notch manufacturer of the popular line of Phantom drones, also entered the stabilizer game with the Ronin and the Ronin M. The Ronin has a payload of 16 pounds, while the M (for mini) offers a payload of 8 pounds. As with other stabilizer gimbals, both behave with the same functionality aside from payload considerations. Support from DJI is also exceptional.



ABOVE: Eric Ulbrich of Freefly Systems on location in Japan, shooting a commercial armed with the RED Dragon and Tilta Armor Man exoskeleton. Ulbrich is also using the Ninebot miniPRO by Segway. RIGHT: The Freefly TERO is a high-performance miniature remote vehicle that provides a completely new and original way to move the camera around. The system allows for extremely dynamic low camera angle shots along with full three-axis control of the stabilizer.

LEFT: A Flybar is affixed to the top of a vehicle, in this case, carrying an ARRI ALEXA.

Both Freefly Systems and DJI are indicative of the innovation in the world of camera stabilization. Other manufacturers are also jumping into the stabilization game by extending the uses of these systems.

Flyspeed, a company specializing in unique camera movement and support systems, has adapted both the Freefly Systems MōVi 10 and MōVi 15 to work on jib and crane arms as a remote stabilized head to attach to cars, motorcycles and other moving platforms. No doubt more manufacturers will follow suit.

It's also important to remember that operating with stabilizer units with heavier loads will quickly fatigue even the most ardent patron of Gold's Gym. As a result, more and more support vests are becoming available in the marketplace to mimic Steadicam operation.

These solutions include the Ready Rig made in Southern California, the L'Aigle Exoskeleton made in France, the Tilta

Armor Man out of Texas, the RUNNER from ActionProducts in Switzerland, and the Walter Klassen carbon-fiber SlingShot vest out of Toronto, Canada. Such vests offer the one elusive axis of support that separates the Steadicam from all basic gimbals, namely vertical movement, and with it, unwanted bounce.

The advent of remote operation of gimbal units is also being seen of late. There are currently three different ways to do this—via radio control like an RC car joystick, a remote pan bar (MōVi calls it Mimic) and brushless gimbal wheels, working like a traditional gear head.

As such developments continue, so does the opportunity for cinematographers to acquire the ability to perform more artistic camera movements. These manufacturers not only are releasing affordable gear, but high-quality equipment never before seen in this segment of the production industry. Steady as she goes! HDVP





BOURNE IS BACK

Cinematographer Barry Ackroyd, BSC, combines film and digital acquisition methodologies with a documentarian's eye to capture *Jason Bourne*

BY KEVIN H. MARTIN

AN AMNESIAC ASSASSIN PURSUED RELENTLESSLY

by his former employers struggles to survive long enough to discover his identity. This was the premise of 2002's *The Bourne Identity*, an adaptation of spy novelist Robert Ludlum's popular series, starring Matt Damon as Jason Bourne. The initial entry in the *Bourne* series was directed by Doug Liman and met with a strong response. Director of Photography Oliver Wood returned for two sequels helmed by Paul Greengrass, focusing on Bourne's past involvement with the CIA's Operation Treadstone, each film upping the visceral excitement, as well as worldwide box office returns.

The Universal Pictures franchise's universe expanded further in 2012's *The Bourne Legacy*, directed by Tony Gilroy and shot by Robert Elswit, ASC, with Jason Bourne in the form of Jeremy Renner as the world-class killing cog in the Treadstone machine.

A sequel to *Legacy*, to be directed by Justin Lin, was already in the planning stages, but was placed on hold after Damon and Greengrass announced their intentions to reteam. Greengrass co-wrote *Jason Bourne* with film editor Christopher Rouse, who also cut this picture, as well as the filmmaker's two prior *Bourne* ventures.

New to the world of *Bourne* comes Director of Photography Barry Ackroyd, BSC (and, since 2014, president of that venerable institution). Ackroyd, who earned a BAFTA for the shot-on-Super16mm *The Hurt Locker*, was no stranger to Greengrass, having shot the director's *United 93*, *Green Zone* and *Captain Phillips*.

"I had a working knowledge of the series, but my knowledge from working with Paul was more important," Ackroyd notes. "What you see in this film is a representation of our mutual thoughts on how this world should look. It wasn't exactly 'cut and print' from our previous experiences, but it came close, both in terms of concept and execution. When Paul took over with the second film, he introduced a 360-degree way of looking around to reveal the world that these characters inhabit."



Jason Bourne's globetrotting production rivaled the scope of a 007 film, lensing along the Las Vegas Strip, as well as Spain (standing in for Greece), Berlin, London and Washington, D.C. To achieve "invisible" VFX that didn't call attention to themselves, the feature drew upon world-renowned VFX vendor Double Negative. Matt Damon reprises his role as Bourne, reuniting the film's title character with CIA analyst Nicky Parsons (Julia Stiles), as well as director Paul Greengrass, who helmed the second and third entries in the popular action series.

Ackroyd, who comes from a documentary background, believes this visual approach is a largely British style, one, he says, that's "informed by the great documentary shooters from the late '60s and early '70s, during the period when Richard Leacock and D.A. Pennebaker freed the camera by placing it on their shoulder. Documentary filmmaker Robert Drew said, 'Fuck the tripod, fuck the dolly, and fuck the crane; just shoot and shoot and shoot!' That sums up a lot of what we do, though, obviously, that isn't to say we forego using equipment to move the camera. Drawing on the work of these artists, along with great and innovative feature work from the '70s, like the work of Haskell Wexler, we tried to apply some of that enthusiasm for visual exploration to this film."

The action thriller follows in the globetrotting tradition of the spy film genre, but omits the postcard views one usually associates with such fare. "Location filming is our go-to, as Paul and I both believe you find truth out in the world on locations," says Ackroyd. "While the film goes city to city and continent to continent, we aren't interested in presenting a travelogue that would detour from the story's emotional focus."

As with any film featuring major action set pieces, previsualization figured heavily during prep. "We do have a heavily storyboarded and worked-out process in place up front for much of the film," affirms Ackroyd, "but we don't ever let ourselves feel locked into the animatic. It does its job, confirming for everyone what we're trying to achieve going in—but none of us would feel that we were really doing our jobs if we limited ourselves to shooting the boards and then going home. For me, with my

documentary background, the goal is to reveal something new, and that's often an interesting struggle to find those elusive elements that surprise."

Another lesson from the documentary world that Ackroyd carries over to features has to do with shooting the moment rather than staging it. "It's an important principle to not interfere with the movement of the subjects," he maintains. "I would never ask somebody to repeat what he or she had done, or tell them to move to another part of the room. In the main, I just want my crew ready to move while remaining focused to shoot whatever winds up in front of them, because it isn't necessarily ever going to be that same arrangement again, plus you don't know when the magic is going to happen."

"Having said all that, there was an interesting moment with Matt during the last week of shooting as we did pickups," he continues. "I saw light coming across his face in an interesting way and asked him to pause in that spot. He turned to me—this is after doing three movies with him—and said, 'That's the first time you've ever asked me to do anything on set, ever.'"

THE REALITY OF LIGHTING

As in the earlier films, the latest *Bourne* features a number of scenes within the offices of the CIA. Another element in the mix this time is the hacker world, which ties into the picture's acknowledged post-Snowden sensibilities.

"Realizing these different aspects are always a collaboration between camera and [production designer Paul Kirby's] art department, this happens in a very fluid way; we don't have

endless meetings. It's largely past experience speaking volumes in informing one another, plus providing reference that everybody can evaluate for inclusion."

The office scenes reflect Ackroyd's perception of how incongruities contribute to the reality of things. "Being European, whenever I walk through an American-style office—and we have lots of those to represent the CIA in the film—no matter how bright the daylight is outside, there are always lights on inside," he declares.

"That's part of the madness of the real world, just like when it's 72 degrees outside, but the air conditioning remains on. Staying true to this kind of oddity tells part of the story and keeps true to the nature of your location, so we try to balance between that and delivering something pleasing to the eye—retaining the beautiful day outside despite distracting light interfering with the view."

On documentaries, Ackroyd would often find himself shooting without lights, instead using the environment to light and shade the scene. "Instead, the first thing you'd do upon arrival—when you've still got the camera in your hand—is go around turning off the lights over the subject's head," he explains. "By positioning myself relative to the existing light and the subject, I can create a pleasing view without forcing anything. That's still part of my philosophy, as well as trying to keep the lighting package small. On location in a high-rise, however, you need to be able to control difficult or extreme lighting situations. Fortunately, gaffer Harry Wiggins is always fully prepared, so if we need to do pickup later, we can match the quality of the light, even if we can't return to the original room where we shot."

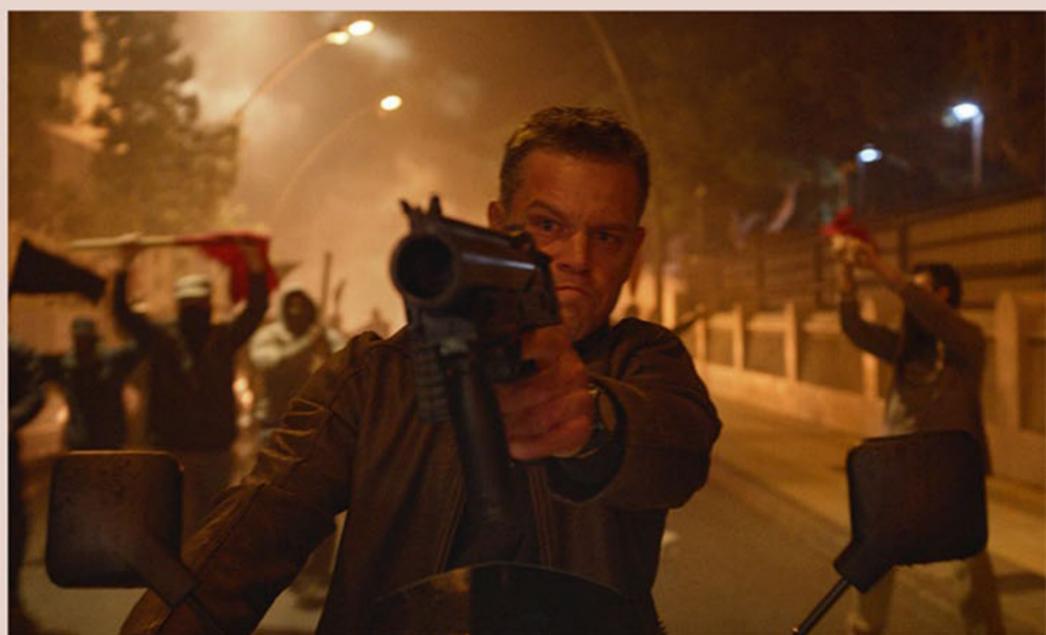
As is his avowed preference, Ackroyd originated the majority of the shoot on film, capturing in 3-perf Super 35 on Kodak 5219 (500T) and Kodak 5207 (250D) with a trio of Aaton Penelopes. His lenses were Zeiss T1.9 Ultra Primes and T1.3 SuperSpeed prime lenses, plus Fujinon, TLS, Angénieux and Panavision Primo zooms. Like much of Ackroyd's earlier work, *Jason Bourne* also includes Super16 footage, shot on Aaton XTR Prods with Canon zooms. Lab-processing duties were handled by i dailies in the UK.

NIGHT, AND THE DIT

The film's night sequences represented something of a departure for the cinematographer, with an early decision to shoot digital with the ARRI ALEXA XT, capturing ARRIRAW to Codex. "Since there were two major 2nd unit chases at night in low-light levels, there was a request to not shoot those on film," Ackroyd relates. "There were as many as 12 cameras involved on some of the more elaborate action [including the new Codex Action Cam], so this was a major step away from our usual methodology, in which Paul and I would shoot nearly all of the action ourselves rather than involve another unit."

Ackroyd was very clear about his intentions and approach for *Bourne's* many action beats in order to maintain a continuity of look. This included several weeks in Las Vegas, during which the old Riviera Casino, slated for 2017 demolition, was refilled with games and slot machines (along with the odd SWAT truck that comes crashing through).

"Some of the 2nd unit guys were from *Fast and Furious*, which is a completely different look to our film," Ackroyd explains, "but in the end, we got it all looking as it needed to be."



DP Barry Ackroyd, BSC, opted to establish the same look acquired on earlier films in the *Bourne* franchise by shooting primarily on Super 35mm using Aaton Penelope cameras, plus Zeiss Ultra Primes and SuperSpeeds. This approach was augmented with Super 16mm, while elaborate night sequences called for the ARRI ALEXA XT and Codex Action Cam. Ackroyd eschewed a high-gloss look, seen widely in conventional spy-adventure films, instead embracing a mostly handheld documentary approach while encouraging his operators to also remain open to inspirational moments during production.

These players included Edge Arm DP Greg Baldi and 2nd unit DP Igor Meglic, while 2nd unit was directed by 007 alum Simon Crane. Digital Sputnik provided their DS6 Frames and DS3 LED systems to facilitate lighting for an enormous car chase shot on the Strip. Digital Orchard, which also provided imaging services for *Bourne's* large night shoot climax, placed DIT Callum Just on the main unit night shoots.

"Barry was able to treat the digital image like film," remarks Just on the experience. "He usually went out with his light meter and sometimes lit by eye, only occasionally having to look at the monitor with me. He didn't want cables in his way all over the



“By positioning myself relative to the existing light and the subject, I can create a pleasing view without forcing anything. That’s still part of my philosophy, as well as trying to keep the lighting package small.”

sets, so to facilitate we went wireless. After testing Paralinx and Teradek, we chose the Cobham HD high-end wireless system, allowing us to see a very nice image in the tent.”

Just calibrated his Sony OLED PVM-A250 monitors using SpectraCal, applying looks and LUTs before passing the feed onto video operator Zoe Whittaker, who would send it out to everyone, and for pulls.

“I used Pomfort’s LiveGrade with Fujifilm’s IS-Minis to do the grading. Digital Orchard always builds custom rigs to go on set, in this case for six cameras. What worked very well on this shoot was having video set up together with DIT so we could work efficiently and both keep on the radio with our focus pullers.”

Goldcrest Post’s Chief Technology Officer Laurent Treherne assembled an appropriate LUT package. “We had a sort of double-conversion going on,” notes Just. “Laurent’s conversion LUTs took the digital into a film space. From there, we took that film space, with CDLs, into whatever look Barry wanted.”

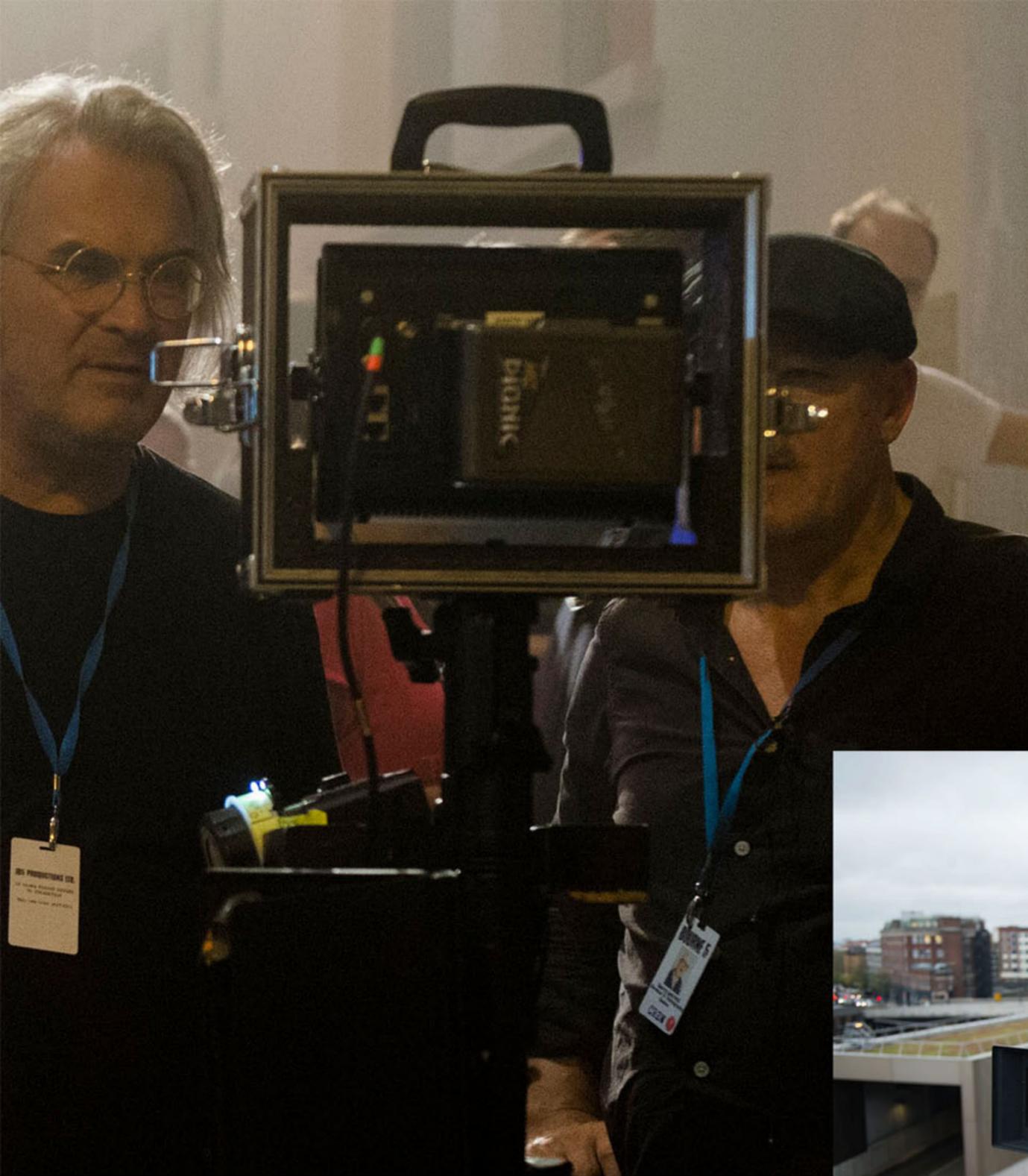
Ackroyd found the film/digital blend effected at Goldcrest to be a largely successful one. “There were a few tiny giveaways in the white areas, but during the grade, we do our best to smooth that over. If you see a 16-sided star,” he laughs, “you know that’s digital.”

Throughout production, the shoot utilized at least three

cameras, one of which would be operated by Ackroyd. “We’re usually handheld and always on the move to find those spots where the light and the subject tell us what we need to know while making a beautiful image,” he explains. “My operators and I can inhabit any position on the compass, and after reset, we’ll modify positions, plus altering where we are on the zoom lens—which gives the VFX people nightmares since they have to keep track of the focal lengths. Double Negative’s Charlie Noble [co-visual effects supervisor with Sean Stranks] and VFX producer Daniel Barrow were on the set nearly every day and, in fact, there’s a massive team sampling, recording, logging and mapping the entire space while we’re shooting, just in case we need a background when doing a pickup.”

To further facilitate the VFX effort, Ackroyd provided DNeg with color grades early in the process to facilitate fitting their work into an appropriate color space.

With expansive exteriors, Ackroyd didn’t even attempt lighting due to issues of practicality. “We try for control at key points and try to find some essential mood indicator,” he remarks. “I might deliberately introduce tungsten into a predominantly blue location, but there are times when it’s best to let go. That I have the time to execute my plans on set is something I owe to 1st AC Chris Carreras. The man is utterly brilliant, and these films



Although Ackroyd and Greengrass had teamed up previously to make *United 93*, *Green Zone* and *Captain Phillips*, this film marked the cinematographer's first excursion into the *Bourne* universe. Ackroyd cites his continuing collaboration with key players, including 1st AC Chris Carreras, editor Christopher Rouse and colorist Rob Pizzey, as the reason for his continued success as a world-class cinematographer.



might only be half as good without him in place. He guarantees that things turn out well through incredibly thorough planning, so the essential resources are always at hand when needed and in the proper quantities. He understands script, as well as huge logistical matters—and the small and important elements, too, like when tea and coffee arrive on set.”

The film's DI is currently underway at Goldcrest Post (as *HDVP* goes to press), with Ackroyd in his second week of grading alongside colorist Rob Pizzey.

“We're sorting things out with Paul's input and often get editor Christopher Rouse in the room to sit with us,” he reveals. “We're all collaborating on the look, figuring out which colors should predominate at key points. Christopher's cutting of our visceral material makes my work serve the plot while keeping the audience on their toes. Colorist Rob Pizzey is also sorting things out with Paul's input, and we often get Chris to sit in as we continue collaborating on the film's look, contemplating which colors should predominate at certain points.”

A UNIVERSAL LANGUAGE

With 4K deliverables rapidly becoming a mandate, the issue of image origination remains a topical and even controversial one. “Technology changes month by month, so for me, it's about

balancing the innovations by retaining those principles that we all began with,” states Ackroyd.

“Several times in the last few years, European cinematographers have been told definitively that 35mm film is out, that it isn't good enough. And we at the British Society of Cinematographers reply, ‘Stop. It's still the finest image, and what we need to aspire to.’ I don't doubt there will be a technically superior format that emerges at some point in the future, but it isn't here yet; departures like virtual reality and the awful failure that was 3D certainly aren't the way.

“Seeing an excellent theatrical presentation in the company of a respectful audience allows a viewer to disappear into the experience of seeing a feature film completely,” wraps Ackroyd on the cinematic experience. “It offer everyone the potential for walking away slightly changed by the experience. That's what drew me to cinema in the first place—it's a kind of universal language that should remain at the heart of whatever you choose to screen.”

HDVP

To learn more about the film, visit jasonbournemovie.com.

PLANETFALL

A spiraling VFX history in the *Star Trek* franchise has led to the latest installment, with effects vendor Double Negative supplying VFX fireworks as the *Starship Enterprise* goes down blazing in *Star Trek Beyond*

BY KEVIN H. MARTIN





All Photos: Kimberly French © 2015 Paramount Pictures

Star Trek's history with visual effects has been both acclaimed and troubled—sometimes for the very same project. The original series, which began airing on NBC 50 years ago, required the services of four separate vendors in order to continue to meet airdates. Unlike several Irwin Allen sci-fi series that also aired in the '60s and could rely on the in-house 20th Century Fox effects team, Desilu (and later Paramount) had no such resource, and the pressure of dealing with elaborate old-style optical effects contributed to at least a few collapses and breakdowns among the crew.

Just over a decade after leaving the airwaves the series returned, but this time to the big screen as *Star Trek: The Motion Picture*. After years of false starts, the film was finally greenlit, in part as a response to the mega-successes of *Star Wars* and *Close Encounters of the Third Kind*,

The production subsequently experienced difficulties that could fill a phone book. (The 670-page *Return To Tomorrow* published in 2014 is a recommended oral history covering much of what went wrong—and right.) Panicked over a near-total lack of progress on the optical work, Paramount wound up dumping its original effects provider less than a year before the film was due—having already been presold—in theaters.

The VFX houses of Doug Trumbull and John Dykstra were brought on to work round-the-clock, ultimately delivering nearly 600 shots in a massive salvage effort that earned the film an Oscar® nom, but left Trumbull hospitalized—and Paramount did make its release date.

Over the next two decades, Lucasfilm subsidiary Industrial Light & Magic provided VFX for six of the nine *Trek* sequels, and also contributed a library of spaceship and starfield elements for the 1987 launching of the syndicated sequel *Star Trek: The Next Generation*.

Miniatures and motion control, coupled with video compositing of originated-on-35mm elements, formed the go-to methodology that enabled VFX supes Rob Legato and Dan Curry to expedite large numbers of VFX cuts for the next decade of *TNG* on the airwaves, including the bulk of the spinoff series *Deep Space Nine*.

By the late '90s, CGI had become a speedy and popular alternative to physical models, and that was reflected in the last two *Next Generation* feature films, as well as the final (to date) pair of TV entries, *Star Trek: Voyager* and *Enterprise*.

When J.J. Abrams rebooted the dormant franchise with the 2009 *Star Trek* and 2013 *Star Trek Into Darkness*, Paramount at last loosened the purse strings for the first time since the original film, up to a nine-figure tune. This enabled the makers, again working with ILM, to put across an incarnation that would appeal to mass audiences without suffering the “tell, not show” element often prevalent in earlier efforts.

The offer to direct a new *Star Wars* enticed Abrams to exit as *Trek* helmer before the film began, though he stayed on as executive producer and engaged Justin Lin to direct. The result: *Star Trek Beyond*, taking place well into the *Enterprise's* planned five-year mission as the crew encounters a new threat to Federation space and are left to fend for themselves after the ship falls prey to swarms of enemy combatants.

To realize the outermost reaches of the 23rd century, VFX vendor Double Negative came aboard. DNeg had previously contributed to the filmmaker's *The Fast and the Furious* features and was no stranger to new worlds, having won an Oscar® for Christopher Nolan's *Interstellar*; the company's first major credit called for them depicting life on another world in *Pitch Black*.

After completing *Godzilla* and then *Exodus: Gods and Kings* (see *HDVP*, February 2015), Double Negative co-founder Peter Chiang served as *Beyond's* overall visual effects supervisor, aided by in-house deputies and VFX supervisors Raymond Chen and Sean Stranks. Chiang's duties also involved overseeing the work of supporting vendors carried over from the two previous films.

“We inherited a good legacy,” he acknowledges. “We maintained a free flow of data between vendors so that assets created at DNeg could be handed off quickly to Atomic Fiction and Kelvin Optical—a company J.J. has an association with—to composite into their shots. QuickTimes and EXR let us get each iteration to Justin so he could approve the



LEFT: *USS Enterprise* science officer Spock (Zachary Quinto) performs his duties aboard ship.

Director Justin Lin brought his trademark visual dynamics to the Starfleet universe, using articulated sets that could shudder and rotate. This aided VFX, as matching passes could be shot when set pieces exploded, allowing for the safe capture of stunt performers in action on separate camera passes. A *Trek* fan since childhood, Lin wanted visual effects that would help convey the vulnerability of starships in battle. He also wanted engaging new visual notions of a virtual city in deep space that plays host to the *USS Enterprise*. RIGHT: Captain James T. Kirk (Chris Pine) and Ensign Pavel Chekov (Anton Yelchin) find a new ally in the form of alien warrior Jaylah (Sofia Boutella) in Paramount's latest space adventure, *Star Trek Beyond*. Here, the trio seeks to escape a hostile world by repairing a long-grounded starship, digitally realized by VFX vendor Double Negative. BELOW: Lin advises Pine on a command decision.



look. The studio was always comfortable continuing with the Kelvin/Atomic formula, so it made sense to carry that forward into this one with veteran VFX producer Ron Ames [*Real Steel*] coordinating all our efforts."

Also carried forward from the Abrams-directed efforts was the *Enterprise* herself—or rather the geometry and texture maps used to depict her in flight by ILM. "All of the digital assets belong to Paramount so we inherited the ILM model," says Chiang. "Even so, there was a lot of shader work needed to translate that into the ship we wanted to see onscreen, which is the Justin Lin version of the *Enterprise*. It goes back in time a bit stylistically, looking closer in appearance to the original TV version, which always seemed a little vulnerable with those slender segments linking the saucer, engineering and the nacelles."

ILM had already altered aspects of the design over the course of their two films, with the repaired starship at the end of *Into Darkness* sporting several cosmetic differences.

"In examining the history of the franchise, you realize the last thing you want to fall into creatively is to just repeat things verbatim," Chiang opines. "Our new changes included adding a 'fastback' aspect to the nacelles, which formed a bit of a 'V' shape going back. We also stretched and thinned both the nacelles and the ship's neck, making

them more obvious targets for the scene when the ship comes under attack."

Depicting 23rd-century military engagements meant the visuals had to offer more than just space-bound battleships firing off broadsides at each another. "Both the director and DP were coming from *The Fast and the Furious* world with its Eyemos and ingenious camera mounts, so we needed to translate some of that energy to the VFX shots," continues Chiang.

"Justin wanted to attain a definite 35mm Panavision camera lens feel—but not as 'flare-y' as the Abrams vision—with plenty of camera artifacting that would help convey a grainy grittiness on a subconscious level. We also took the opportunity to give fans close looks at parts of the ship they've never previously seen from these angles, a way to pay tribute to the fantastically original design of the TV ship [created by series art director Walter 'Matt' Jefferies]."

GETTING THERE IS HALF THE FUN

Chief among the givens in *Trek* is a depiction of faster-than-light travel by starships, called warp drive.

"In the past films, there was always a kind of light-driven way they had for showing the streak to warp speed," says Chiang. "In reevaluating our options, this gave us a chance

to take inspiration from real physics for our warp effect.”

This wasn't the first time a scientific muse was brought to bear on this issue. An unused concept for depicting warp in the first *Trek* feature derived from suggestions by the science advisor, NASA's Jesco von Puttkamer. Artwork showing the *Enterprise* encased in a warp bubble that refracted a color-spectrum-shifted starfield around it was suggestive of a pre-*Interstellar* majesty, but dropped in the actual film in favor of a more straightforward shutter-open streaking of the motion-control stage miniature.

Chiang's research led him to the idea of presenting the warp bubble as seeing space fold around the ship. "Right from the outset, I was presenting Justin with ideas on how this could look," he enthuses. "We did studies on how light is bent by gravitational lensing, then looked at high-speed shooting of 3000 to 4000 fps to see how bullets create a wake as they travel through water. We also scrutinized images of planes and their vapor trails as they go beyond the sound barrier. I imagined multiple shock waves building up and stacking on one another, forming this layer ahead of the vessel. That tells us we're traveling at high speed and gives a dimensional quality to it."

DNeg utilizes the Clarisse iFX package from the French company Isotropix, which combines a 3D-rendering engine with animation package and 32-bit compositing software.

"We've transitioned in recent years into ray-traced rendering, which provides extremely realistic lighting simulations," Chiang reveals. "It was only due to this approach that we've been able to capture such an extraordinary look for this lensing bubble effect."

Chiang was also able to influence the aesthetic of starships in the void. "We looked at a lot of NASA footage to see how the whites blow out in genuine conditions of harsh direct sunlight up there," he states. "And I wanted to introduce a lot more of a feel for 3D space this time, in terms of ship and camera movement. That way, it wouldn't all be so linear, and instead reinforce how there's no up or down in this environment. Playing with that harkened back deliberately to a bit of the *2001: A Space Odyssey* feel, when Kubrick had that *Orion* space clipper docking with a space station; you had perspectives constantly changing with these rotating objects."

THE CITY ON THE EDGE OF FOREVER

When the *Enterprise* rendezvouses with distant Starbase Yorktown, the perceptual gymnastics that Chiang enthuses over are clearly evident.

"The base is out at the frontier of Federation space, constructed as a series of angled structures, set on these sea-urchin-like arms within a 16-mile diameter sphere," he explains. "Using a volume of space in the most efficient and economical manner would absolutely be the way to go with structures out there, and that meant maximizing the inner volume."

To provide cinematic variety to the scenes set in Yorktown while simultaneously implying a deliberate Earthlike feel to life, a day/night lighting scheme was evolved.

"We played with the idea that the sphere surrounding the station was opaque during the day, but that the inner hemisphere becomes more transparent at night, letting the





OPPOSITE: Sofia Boutella and Lin discuss an upcoming fight scene. Extensive hand-to-hand action is upped considerably in *Beyond*, with trademark “looks” from the *Trek* universe. VFX supervisor Peter Chiang relied on Double Negative’s in-house “Star Trek Yodas” for expert advice to those not so well versed in the 50-year-old franchise. ABOVE: An injured Spock is aided by Dr. Leonard McCoy (Karl Urban) after the *USS Enterprise* crashes. The often-charged dynamics between these characters, previously portrayed by Leonard Nimoy and DeForest Kelley, made up a huge part of the appeal of the original TV series, as well as the first six feature films.

inhabitants see the stars outside,” adds Chiang. “That would be a comfort for visiting space travelers.”

Live-action for Starbase Yorktown was shot in Dubai, a locale that features some of our world’s most space-age/futuristic skyscrapers. “The plates shot there served as a basis for our finals,” says Chiang, “but we had to embellish very extensively for pretty much every view. Everything changed color-wise, since the Federation is principally blue, white, silver and black, but Dubai feels very beige/yellow.

“During shooting, we were very conscious of what was supposed to be visible overhead, and framing took that into account,” he notes. “We had LIDAR scans done of about 40 buildings there that worked for our purposes architecturally. These were heavily textured, and we could put those assets into frame procedurally to populate the background and the other arms of Yorktown overhead.”

Captain Kirk and the surviving crew spend most of the film marooned on a planet, mixing it up with alien combatants while seeking a means of escape. Along the way, many trademark *Trek* elements are woven into Lin’s action mix, from transporter beam-ups to gunfights with hand phasers, the latter requiring coordination between VFX and production’s live-action crew.

“Special effects supervisor Cameron Waldbauer was great about providing us with blue-white spark hits for phasers and

green sparks from the Marauder swarm soldiers,” Chiang notes. “He created pyrotechnics in the form of fireballs for us, like the one in the trailer behind Kirk and Chekov, which we’ll enhance just a bit. When there’s a specific choreography in play involving our animation, we always shoot a clean plate, as well, but what those real-world interactives give us in terms of credibility and reference is just extraordinarily useful to us.”

While screenwriters Simon Pegg and Doug Jung relied on a fan website to inform their *Trek* knowledge, Chiang had his own in-house equivalent.

“We found that every facility working on the show had what I call ‘*Star Trek Yodas*’ working there,” he laughs. “Each of them was like a kind of brain trust you could question to find out if some design or maneuver went against what had been established on other *Trek* shows and films. We had sequences with a vessel from an earlier century and the design process took a bit of a hit when the Yodas told us it should reflect what had been seen in the 22nd century on [*Star Trek: Enterprise*],” he muses.

“Even with all that, it was a real honor for me to work on *Beyond*,” says Chiang, “and I think we gave both fans and the general audience a new way of looking at the familiar sights in the *Trek* universe.” HDVP

To learn more about the film, go to startrekmovie.com.

The original Star Wars trilogy

Among the many contributions Phil Tippett made to George Lucas' original *Star Wars* trilogy were the miniature creatures for the holographic chess sequence in *Star Wars: Episode IV—A New Hope*. "George had wanted to do the chess scene as live-action people with masks on," recalls Tippett, "but another movie had a similar hologram so he suggested doing it in stop motion. We knocked out some of these creatures in less than a week, and used some of the puppets I had made already from past experiments. Then we went in and shot at it over a couple of days."

Having impressed the director with these alien designs and his animation skills, Tippett, along with Jon Berg and

Dennis Muren, was called upon to animate the almost elephant-like AT-AT walkers and the Tauntauns on the ice planet of Hoth in *Star Wars: Episode V—The Empire Strikes Back*. The meticulous frame-by-frame approach took advantage of the motion-control equipment developed for the first *Star Wars* film—the result was that helicopter-like camera moves could be achieved on the walkers and Tauntauns within the snowy environment.

To illustrate how a puppet could be animated with realistic motion blur, Tippett tested the shot first with an existing model he had made for Joe Dante's *Piranha* (1978). Sweeping moves on Hoth were realized with motion-control cameras, computer controlled so that

[1] The Rancor in *Star Wars: Episode VI—Return of the Jedi*. "Initially," says Tippett, "George wanted to do a man in a suit. I was in charge of on-set and live-action creatures for the Jabba the Hutt scene, so some of the guys back at the shop at ILM started building a suit a performer could wear based on my designs. But it wasn't really working. In the end, George said, 'Oh do whatever you want to do!'"



[2] Phil Tippett adds final touches to the Rancor puppet seen in *Star Wars: Episode VI—Return of the Jedi*.

multiple passes could be filmed and optically composited. "These motion-control rigs were already there for the space battles, so we figured out ways of using the forward momentum to get the motion blur when the camera shutter was open," explains Tippett.

On *Star Wars: Episode VI—Return of the Jedi*, Tippett designed the Rancor, a fearsome creature living in the dungeon of Jabba the Hutt's palace. It was operated as a hand-and-rod puppet, with Tippett controlling the head from underneath a miniature set, while others controlled its hands with bicycle brake-type levers. "We shot everything at between 72- and 96-frames per second, so the takes were really fast," says Tippett. "What was going to show up on the screen was only four seconds, so it had to be shot in less than two seconds. Sometimes we would shoot 70 takes."

MASTERS OF

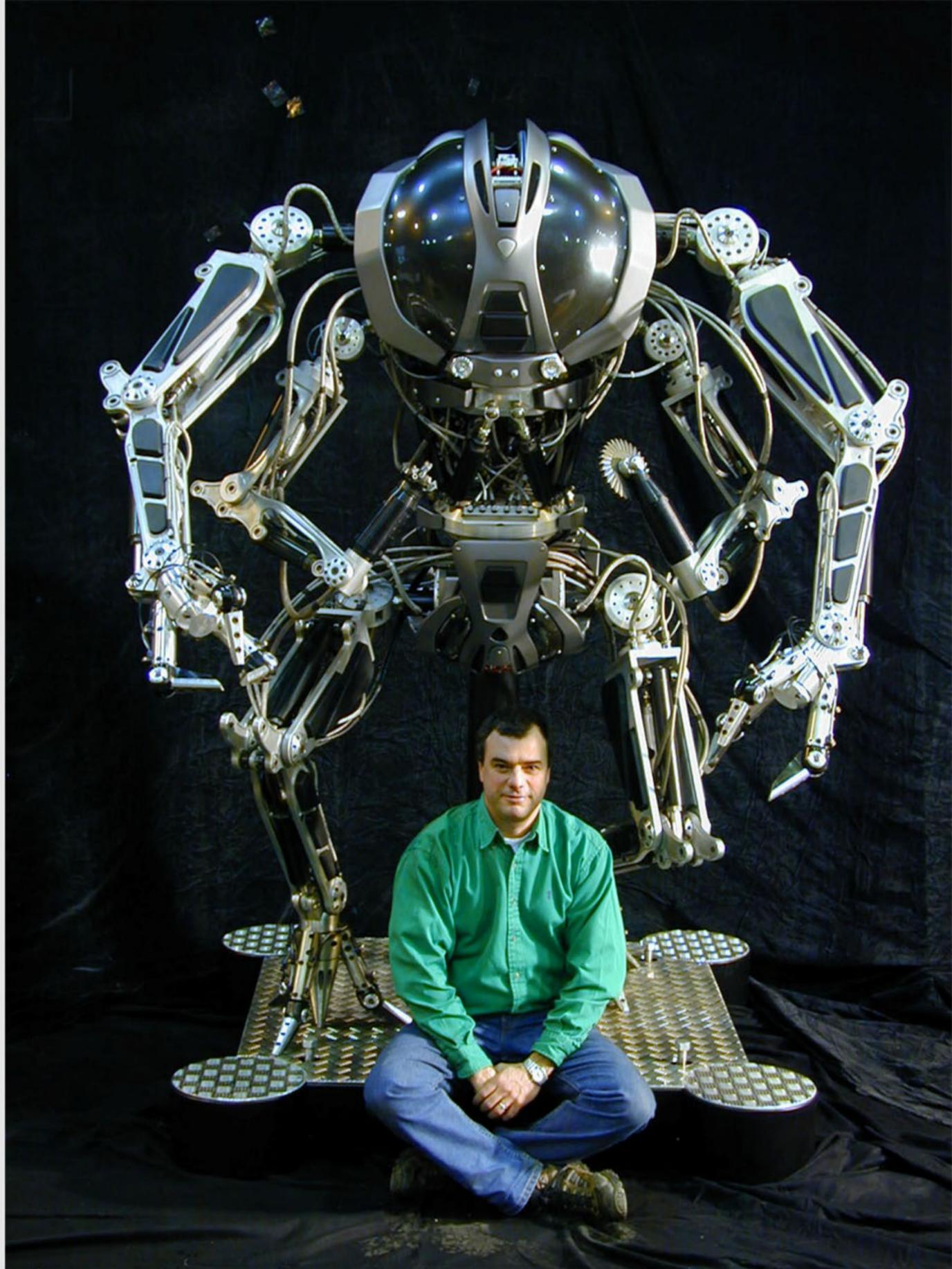
An informed read on the state of the art in cinema VFX from the artists who got us here

BY KEVIN H. MARTIN



LEFT: Phil Tippett adds final touches to the Rancor puppet seen in *Star Wars: Episode VI—Return of the Jedi*. RIGHT: Special effects supervisor Chris Corbould poses with Lara Croft's training robot S.I.M.O.N. from the original *Tomb Raider* film. The life-sized prop was fully poseable and facilitated use of squibs, as well as other "live" effects work. It also served as lighting reference for its CG counterpart. Corbould's genius for wrangling as much movie magic in-camera as possible has led the special effects maestro to work on all of the James Bond films since *Casino Royale*, as well as Christopher Nolan's ambitious features from *Batman Begins* through *The Dark Knight Rises*, winning an Oscar® for *Inception* along the way.

Courtesy of Chris Corbould OBE



Once upon a time, "making of" books on movies were more the exception than the rule. For aficionados of the silver screen, pickings were even slimmer; in 1970, there was a thick paperback released entitled *The Making of Stanley Kubrick's 2001: A Space Odyssey*, with 96 pages of photos that exposed, if not the secrets of the universe, then at least some elaborate tricks of the trade invented for that visionary film.

Star Wars would later ignite a voracious appetite for "How'd they do that?" behind-the-scenes books. They became more common, though some VFX-related volumes were really nothing more than photo books with captions.

Written by former *fxguide.com* staff writer Ian Failes, who continues to document visual effects on his VFXBlog

site, *Masters of FX* examines a number of notable effects seen in films from the last half-century of cinema. The author documents this period through interviews with 16 distinguished effects artists, ranging from grand masters Doug Trumbull, Richard Edlund and Dennis Muren to a host of next-generation VFX stars such as John Knoll and Paul Franklin.

Each segment commences with an overview of the artist's work, followed by discrete looks at projects of interest. This is an ingenious way to chart each artist's career progression while enabling the reader to examine how new tech impacted their approach to the work. A fortunate side effect of Failes' book is how it affords different perspectives on work created by various artists on the same film—as is the case when the various



Courtesy of Trumbull Studios

LEFT: Douglas Trumbull, here working on various colored artworks, took streak photography to new heights with his slit-scan system on *2001: A Space Odyssey*. Using a moving camera and open shutter in conjunction with custom artwork, he was able to depict bizarre starscapes with immense depth—an early evocation of what would become his lifelong pursuit: immersive cinema.

RIGHT: VFX art director John Bruno faces off against Onionhead from *Ghostbusters*. Bruno later supervised VFX on numerous James Cameron projects, including his Oscar®-winning work on *The Abyss*. Though his background was in animation, Bruno's approach to realizing effects is multi-pronged, as evidenced by his mixed miniature/CGI approach to creating the Golden Gate Bridge in *X-Men: The Last Stand*, as well as his creatively bold call to suspend a winged performer on wires while flying above San Francisco in the same film.

disciplines encompassing “movie magic” run the gamut from physical on-set effects to the wholly digital.

This overlap happens with the discussion of several Christopher Nolan films. *Inception* (featured in “Dynamic Duo,” *HDVP*, August 2010) is represented through input from model maker Ian Hunter, VFX supervisor Paul Franklin and physical effects supervisor Chris Corbould, each providing a piece of the whole that reinforces Nolan's resolve to never scrimp when it comes to maintaining visual credibility.

One pleasant surprise is that the book doesn't rely extensively on the same old stories being recounted for the nth time. Many anecdotes are either new or provide additional information to the existing lore. When Richard Edlund explains that he made his own filter to shape the light coming from Nazis suffering the wrath of God in *Raiders of the Lost Ark*, I broke off my reading to watch the DVD and see for myself; I had always thought it was achieved by the main unit employing some ancient lens with unique flare properties.

Rob Legato's career spans approaches that were very low tech on *Star Trek: The Next Generation* to pioneering the first serious commitment to motion capture in *Titanic*. Legato provides candid responses about the increasing reliance on VFX to



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deliver too-big-to-believe visions and how they can hinder audience acceptance. His assessment of the way VFX integrates into films today is a telling one, noting that in the past VFX and live-action would be orchestrated together to build a sequence to a visual crescendo, while now, he says, "All the shots are crescendo moments, with little cinematic setup to build to a climax. More actually becomes less."

The volume is well illustrated, though sometimes the shots described in the text aren't represented with images—but that's part of the fun. I found myself streaming films from Netflix and Amazon to refresh my memories on various sequences described in the book, and to find out what all the excitement was about on films that I hadn't taken the time to see. Failes chooses wisely with the films covered; with respect to the era when analog and digital techniques were being combined, *Death Becomes Her* might be the only significant omission.

More than being a mere primer on practical and visual effects work, *Masters of FX* offers the reader a taste of the philosophies that inform the decision-making process. It clearly isn't always about using the newest tech, but choosing methodologies wisely, mixing and matching techniques to achieve an overall effect that exceeds the sum of its parts—even if that means "going retro,"

like *The Right Stuff*, where the makers often wound up setting their MoCon rigs aside to throw jet plane miniatures at the camera.

You won't find a rehashing of the "How did *Babe* beat *Apollo 13* for the effects Oscar?" debate here, but you'll be more appreciative of the work that went into both films. And, perhaps, something in these pages will both inspire and inform your own future efforts.

Anybody up for shooting a hanging miniature live in-camera? HDVP

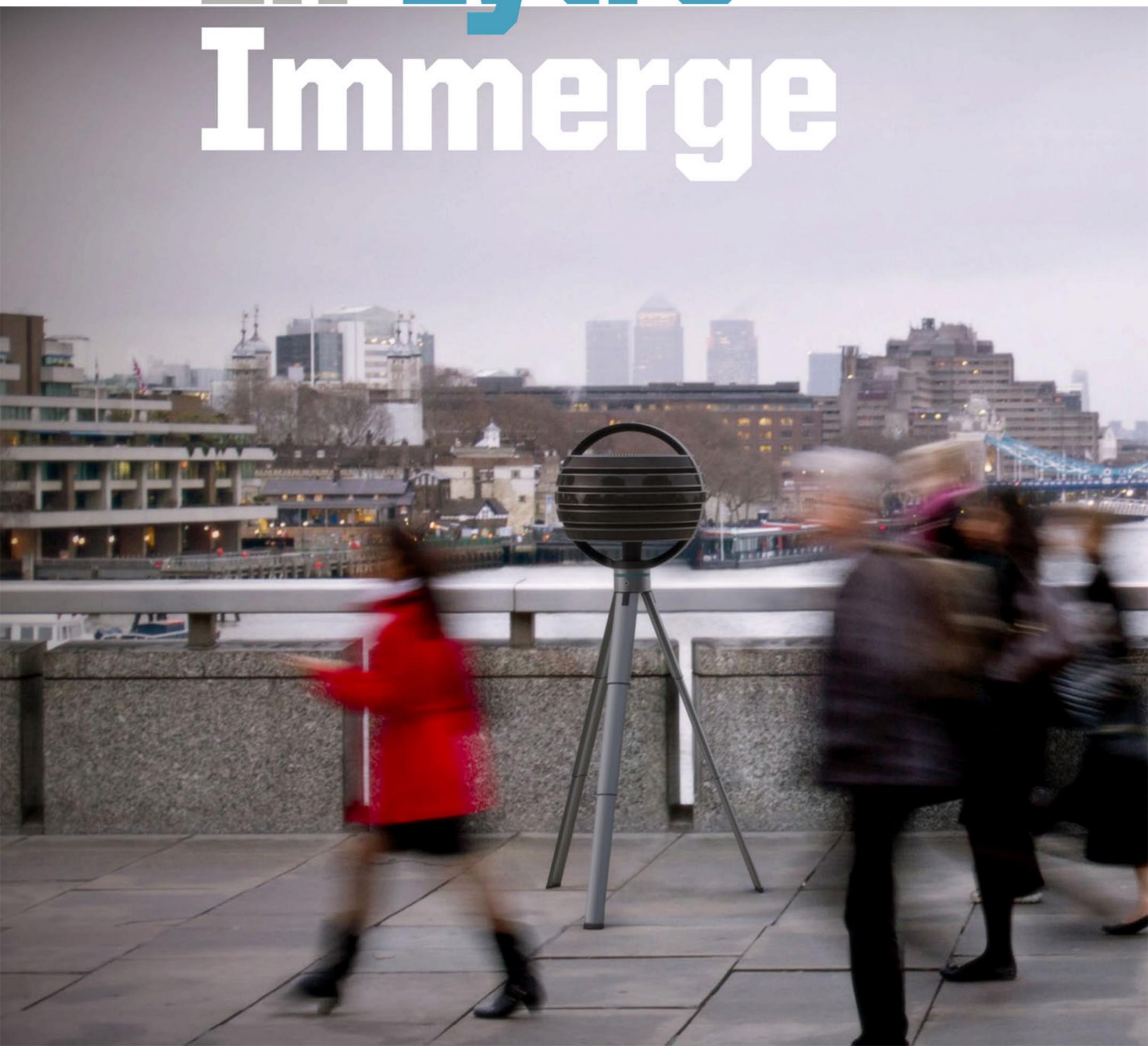
"Masters of FX" is published by Focal Press and Ilex Press, and available domestically through Amazon in print and ebook form, and in the UK via Amazon UK and Apple iBooks UK.

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Light-field technology is the most exciting and potentially disruptive thing to happen to filmmaking in over a century, and it just might revolutionize VR, too *BY ROBERT POWELL*

Immersed In Lytro Immerse



In film production, the phrase “We’ll fix it in post” has always been synonymous with mistakes and failures. Just this month, I was on a commercial set calling for a live Bengal tiger to be shot in front of a greenscreen. Unfortunately, the spot’s director and production team were so enamored with filming the beautiful animal that they completely forgot to shoot plate images (empty shots of each scene to superimpose the tiger into later) until production had wrapped. This forced the agency to choose between two costly alternatives—either reshoot the scenes or find a workaround in postproduction.

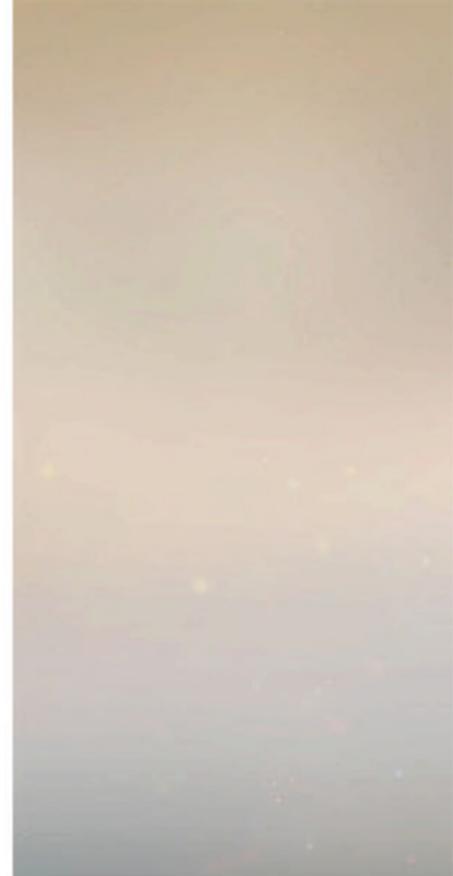
Almost every filmmaker can relate to these experiences, be it lack of coverage, blurry takes or an ever-present boom mic suddenly entering the frame. But such impracticalities in production could soon be a thing

of the past with the introduction of the Lytro Immerge light-field camera. The camera system is built around capturing a 3D light-field volume that allows creators the freedom to manipulate and manage all aspects of their images in postproduction rather than at the point of capture. It can also be used on professional virtual reality (VR) productions with technology allowing for a level of immersion that simply hasn’t been possible from any other camera in existence.

THE PROMISE OF LIGHT FIELD

If you study the history of photography from the early daguerreotypes to today’s high-resolution digital images, it seems amazing how far we’ve come. But innovation in photography hasn’t accelerated as much as we may surmise. We still capture all of our images on a flat





2D plane, which is then relegated to a small rectangle. However, the move from analog to digital has allowed for an explosion in the technology of photography and video capture.

Now, through new research in light-field technology, it's possible for extensive breakthroughs in optical and computational imaging, something Lytro and many of Silicon Valley's brightest investors believe is the future of VR production.

Without a doubt, VR is a burgeoning medium for narrative content. One only need look at the early work of primo content creators such as Félix & Paul, VRSE and WEVR to recognize that creativity in the VR space is already outpacing the limits of current production technology.

Nothing is more important than "presence" in VR, the feeling of being completely immersed and transported into a new world. Current camera rig systems used in production have become an impediment to this presence, providing only static flat image capture with no solutions to significant problems including image calibration, resolution or parallax distortion, just to name a few.

The debut of spherical 360° video was an important step in the introduction of VR to the masses, but the promise of accessing worlds where people can move and interact with each other is the true potential of the medium, something VR consumers already understand.

The Immerge camera has a radical multi-tiered lens system that's unlike anything ever witnessed on a camera. Its design allows for thousands of microlenses to capture a scene from numerous perspectives that are all built into a final capture model from a full light-field volume.

This allows users the freedom for more realistic head movement, as well as the ability to change perspective while moving around in space, something that has only been achieved in video games and CGI.

THE CAPABILITIES OF LIGHT FIELD

The Lytro Immerge is radically different from any other camera on the market. Its light-field technology uses an array of microlenses placed in front of an image sensor to sense the intensity, color and direction of all rays of light within a given space.

These thousands of tiny microlenses allow for capture of the entire light-field volume, along with light ray data for the Lytro Immerge to create a 3D model of the scene being viewed. The camera is always heavily oversampling in every direction to record as much information about the scene as possible. Along with that oversampling comes an obscene amount of data.

To handle that data, the camera comes with its own large server to store and process captured footage. Lytro is also developing other end-to-end solutions, such as postproduction tools that can be integrated into existing VFX tools such as NUKE, as well as a cloud-based video player for distribution.

Despite the obvious drawback of having to output immense sizes of data to a server, the camera does offer filmmakers a torrent of features that will enhance the filmmaking experience. Along with that comes extensive control in postproduction over the images they capture.

Here are a few more of the varied features of the Lytro Immerge light-field camera.

Depth of Field. One of the core benefits of the camera is infinite depth of field. Everything captured can



The Lytro Immerge captures light fields in motion in stereoscopic 3D and in 360 degrees. Its stackable microlenses pull in light from every angle to render high-resolution, high-frame-rate data to create immersive experiences for positional-tracking headsets like the Oculus Rift, HTC Vive and Sony PlayStation VR. This extremely accurate method of capturing information allows VR users to move and walk around inside the recorded scene as if they were actually there. The camera's features also point to its use as a groundbreaking tool in post.

be placed in focus, or focus points can be changed and resampled within the scene. The Immerge also offers a shallow depth of field far beyond any traditional camera system, offering capabilities far beyond any traditional or VR camera rig available on the market.

Another feature of this infinite depth-of-field scenario is that it plays into other features such as computational frame rates and shutter angles, allowing filmmakers to play with things such as frame rate and motion blur on an artistic level in post, rather than having to “bake in” these elements at the moment of capture.

Dynamic Range. The Immerge has, in essence, an aperture that never has to be stopped down, meaning it's capable of shooting in extreme low light, even scenes with candlelight or moonlight using a wide depth of field. This isn't even conceivable with other contemporary cameras.

Even more amazing is an ability to change exposure and dynamic range later in postproduction, possible due to the camera's constant oversampling of data pulled from each image captured. This allows filmmakers an unprecedented level of freedom that no other 2D camera comes close to matching.

Lens Replication. Yet another massive benefit for filmmakers is the camera's computational optics systems that can match the character of any predefined lens on the market. Since the oversampled master shot from the light-field camera has a flat response, the image can be augmented in postproduction to replicate the parameters of any selected lens. This means no more spending thousands of dollars on rare lenses or having to rent cases of priceless anamorphic lenses from a camera house.

Visual Effects. The Lytro Immerge lends itself

especially well to productions requiring heavy VFX work. It can semiautomate several tedious processes while eliminating several others all together, leading to major cost-cutting benefits for those using it in VFX.

Because light field is always measuring the light, plus where the subjects are in relation to the camera in a 3D model, each object already exists as a layer. That means there's no need to isolate an asset, or person, in front of a depth screen for VFX shots, meaning you can input VFX into the scene without the use of a greenscreen.

Implementing VFX into any footage shot on the Immerge should be seamless, as their postproduction tools have been built to be integrated easily with VFX programs such as the aforementioned NUKE.

Other incredible features include automated 3D camera tracking and the freedom to re-light a live-action scene later in post.

THE FUTURE

Time will tell if the Immerge can live up to its full potential and its lofty promises, but delivery of just one of these game-changing features is an incredible step toward easier production for 2D and immersive live-action experiences.

With several major position-tracking headsets slated for release across 2016, Lytro could find its camera system in high demand. One thing is certain: Light field points to a world where we no longer enter production with a goal to shoot for post, but rather to shoot in post after the production is done.

HDVP

The Lytro Immerge will be released before the end of 2016. Check out Lytro.com for more news and information.



PUMP



IT UP!



Reebok is world-renowned for its Pump technology, an inflatable feature in coveted shoes released to the public back in 1989. It was the first line of athletic sneakers with an internal inflation mechanism, a unique-fitting cushion located in the shoe's tongue to provide a firm lock around the wearer's foot.

One of the biggest moments in Reebok's history came shortly after the shoe's release, when Boston Celtics point guard Dee Brown slipped on his Omni Zone Pumps at the NBA Slam Dunk Contest in 1991. Brown stopped to pump up his Reebok kicks before each dunk, going on to win the event in front of millions of viewers.

Fast-forward 25 years, and Reebok is back with their latest incarnation of the beloved Pumps, resurrecting the company's patented technology by taking a completely new approach to shoe inflation. While the original shoes featured a chamber inflating outward to enlarge the shoe's size and thereby achieve a snug fit, the new Reebok ZPump Fusion 2.0s work differently, constricting inward to create a tight fit without any bulk or heft. As a result, the new technology tightens around the foot in a design that's both lighter and thinner than the original shoes.

Matt McLaughlin, director of production for Reebok, explains it was imperative to find a compelling way to advertise the company's new state-of-the-art technology to audiences worldwide. "The challenge was to communicate technology that isn't visible on the outside of the shoe, and in a manner that hadn't been done before," he outlines on creating the new Reebok branding campaign.

McLaughlin turned to filmmaking and motion design studio weareflink to create the commercial after the German-based company pitched Reebok a compelling idea to highlight the feel of wearing the shoes, as opposed to merely showing its tech.

Managing Director/Executive Producer Andreas Lampe and Director/Motion Designer Niko Tziopoulos make up weareflink, a highly regarded effects team that's recognized for blurring the boundaries between design, visual effects, computer graphics and live-action shoots. Both bring experience from multiple disciplines, with Lampe working as a creative director with talent including Oscar® winner Janusz Kaminski and Academy Award®

nominee Wolfgang Petersen. Meanwhile, Niko graduated in Communication Design and New Media Arts from the Design Factory International in Hamburg before becoming a web designer, art director and motion graphics artist.

Before taking on the Reebok campaign, weareflink had also produced work for global icons such as BMW, Audi, EA Sports, MINI and Lamborghini, winning awards at the Cannes Lions International Festival of Creativity, the Andy Awards, the Clio Awards and more.

"We examined the Reebok shoes and decided not to illustrate the Pump technology itself, but rather the feeling of wearing that technology," explains Lampe on their creative approach. "Our concept was to avoid the use of fancy CG/3D motion-graphic fabrics transforming into a shoe. Instead, we connected the features of the shoe with the running experience. We figured that, in

an ideal world, the features of such footwear should simply let you enjoy the experience. As a result, we needed to decipher the right metaphors for the different features of the shoe, all without ignoring the Reebok philosophy."

McLaughlin had seen one of weareflink's award-winning commercials when the pitch came in. Entitled "Ink," it was indicative of the studio's abilities.

Created for China's leading television network, CCTV, "Ink" shows different cultural and social elements coming together to celebrate the 60th anniversary of the People's Republic of China. The work featured an incredibly complex mix of effects

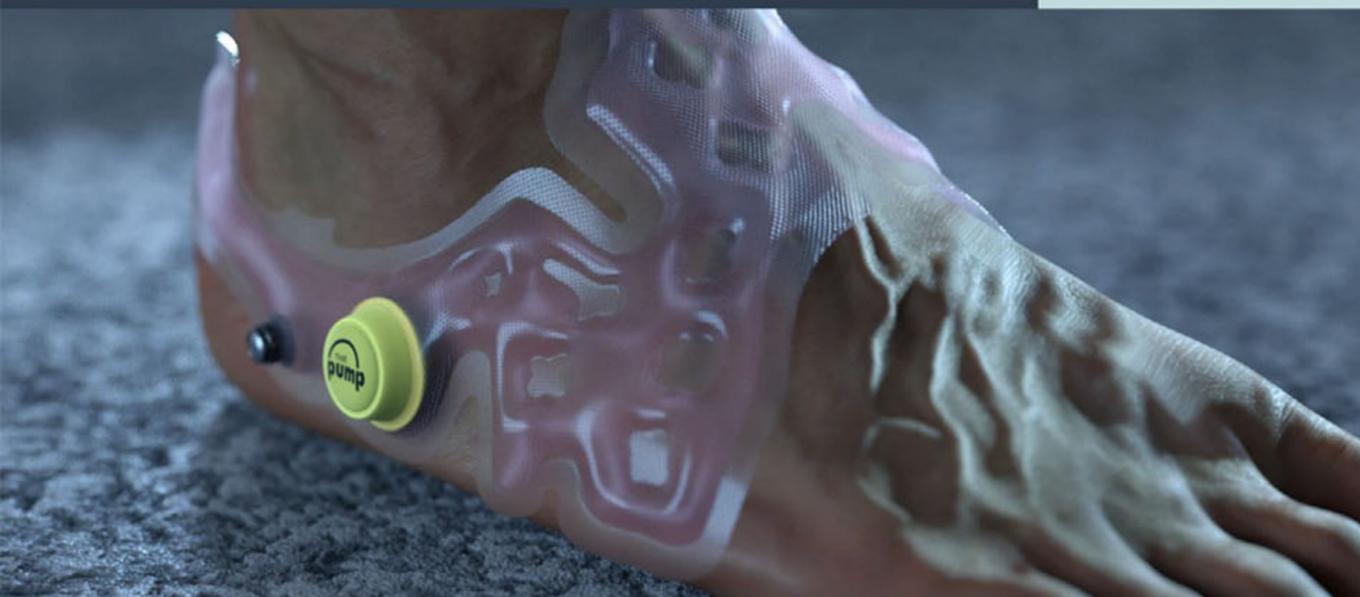
that required the production of billions of particles shaped into Chinese landmarks, all transforming into mountains, fish and birds before finally morphing into people practicing the ancient art of tai chi. That work, along with weareflink's unique idea to show the Pump technology, won the day.

"They pitched a powerful concept using organic metaphors from nature," explains McLaughlin. "This was exciting because it allowed us to highlight the ZPump Fusion 2.0 technology in a highly visual, very unique and truly engaging way. The 2.0s introduce a new feature called Powerframe for additional support that weareflink emphasized so beautifully in their work. They brought a sophisticated look and feel to the campaign that rises above other work in this category."



A global commercial campaign for Reebok's ZPump Fusion 2.0 shoes features effects-driven work by German-based design studio weareflink

BY SIMON WAKELIN



An organic mix of eye-catching effects layered together beautifully by weareflink conveys the feeling of wearing a new pair of Reebok ZPump Fusion 2.0 sneakers. The commercial reignites Reebok's iconic Pump technology, first created by the global athletic footwear and apparel company back in 1989.

All primary footage was shot on stage using the RED DRAGON, with further imagery captured on location using a Sony a7 camera. One or two additional shots were nabbed from stock footage. For most of the CG-generated shots, Cinema 4D Studio was employed, along with the GPU-based engine Octane. All 2D tasks and compositing were completed using Adobe After Effects.

"At weareflink, we're not bound to a certain toolset," adds Lampe. "Our decisions are always depending upon what we deem best for each production. In this case, we also used Softimage with Redshift Renderer."

The final result is a mesmerizing mix of visuals created via live action, animation and digital effects to convey the experience of running in a pair of ZPump 2.0s. The campaign has been released across 120 markets worldwide and shown in cinemas, as well as in Reebok stores and various locations online.

It's the latest in the company's continuing "Be More Human" rally cry, urging consumers to take on physical activity and experience healthier lifestyles. It also promotes Reebok as an experiential brand, returning the company to its fitness roots.

"We continue to speak out with an authentic voice, communicating with inspirational work and products that inspire people to follow healthy, happy lifestyles," McLaughlin adds. "From a pure fitness perspective, the quality of our product has never been better."

The Reebok campaign will be the first created by weareflink seen in America. As a result, they recently won commercial representation stateside, joining production company Joinery in Los Angeles. When asked what separates them from other effects studios, Lampe references weareflink's love for natural effects that he feels comes through in their final product.

"I think the key is to create work that feels organic and to never do anything out of vanity," Lampe reflects on their unique effects-driven approach. "A lot of effects are good, but they lack heart. We focus on what's right for each brand, and continue to be inspired by the potential of making unique and compelling content for clients across the world." HDVP

Check out weareflink's commercial for the Reebok ZPump Fusion 2.0 kicks at youtube.com/watch?v=Wrr2H7nE1pQ.

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¡FELIZ CUMPLEAÑOS!

BY VALENTINA I. VALENTINI





Cinematographer Terrence Hayes lights a fluorescent Mexico on RED DRAGAON and Kowa Anamorphic lenses for *Happy Birthday*

A FAST-MOVING, fly-by-the-seat-of-your-pants thriller, *Happy Birthday* is the story of Brady Baxter, taken on a drug-fueled, death-defying journey through Mexico after discovering his girlfriend is cheating on him. The film marks Casey Tebo's feature directorial debut, a natural evolution for the talented Massachusetts native, who started out directing live-performance broadcasts for Disney/ESPN, the NFL and MTV, working with bands including Mötley Crüe, Judas Priest, Velvet Revolver and Aerosmith.

Following the success of his short sci-fi film *The Captivus*, Tebo wrote a feature noir thriller requiring a \$5 million budget. Jay Cohen, a finance agent at Gersh, loved Tebo's script, but suggested he start again with a smaller film and a budget of \$1 million. Tebo came back with *Happy Birthday*, and Cohen secured financing a few months later. Tebo also included a role for Steven Tyler in the film after striking up a friendship with the Aerosmith frontman earlier in his career.

Cinematographer Terrence Hayes shot on the RED EPIC-M DRAGON during production, capturing 4K resolution in 2:39.1 format on a set of vintage 1970s Kowa Anamorphic lenses. "It's definitely a trend," notes Hayes on the wider use of vintage glass for high-resolution cameras.

After testing a number of lenses before production, Hayes quickly settled on the Kowas for their beautiful lens flares, softness and particular falloff. They were also light and easy to carry, allowing handheld operation throughout the shoot, with Hayes favoring the 40mm length for wide and medium shots.

"I also loved the 75mm for the close-ups, and shot mostly at T4," he adds. "Any more than that, and the resolution would fall apart at the edges. The glass was perfect for softening high-detail harshness and stopping the film from becoming too crisp, too in your face."

As for resolution, 4K was more than enough for Hayes. "People are resolution-hungry with 4K, 8K, whatever K, but I remember one of my professors at AFI saying, 'You've got to shoot on the medium that's the most seen.' Unfortunately, that's iPads, iPhones and home computers, so all that resolution often gets thrown out the window."

While the story of *Happy Birthday* unravels in Mexico, production took place in Los Angeles. Tebo and Hayes brainstormed a look to match the storyline and location. Their first idea was to use tobacco-colored filters to achieve a corroded, south-of-the-border feel. "It's a classic, rusty, yellowish tone, but we didn't want to go with that," Hayes explains.



Instead, Hayes showed Tebo street photography he'd taken in Mexico on a recent scouting trip, and what really stood out was the abundance of fluorescent lighting. "There's a garish, green look that we didn't want to correct," Hayes reveals. "We used that with plenty of sodium vapor, as that's what's seen in Mexicali and Tijuana. There were a lot of warm colors, too, but the contrast with green fluorescents was what we wanted."

Although *Happy Birthday* is Hayes' first stint as cinematographer in the horror/thriller genre, it's not his first rodeo. He operated and shot second unit alongside DP Steven Poster, ASC, on Richard Kelly's *The Box*, produced by Sean McKittrick and Darko Entertainment, the same people responsible for producing *Happy Birthday*.

"I've been floating around the horror/thriller genre for a while," Hayes explains. "Nowadays, there seems to be a big departure from the conventions of the classic horror film. Take any Seth Rogen film; they're one click away from becoming horror stories. His films aren't high key; they're stylized."

Hayes feels this stylized approach to storytelling also allows cinematographers to play. "It's all centered around the story," he continues. "I told Casey when we first started that I work for the story, always fighting for what I believe is right. We may butt heads, but at the end of the day, I'm hired for my vision because I know what I'm doing, and that's my job."

Challenges during the shoot included the very final scene of the film, footage requiring magic-hour lighting

to work, translating to only 20 minutes of time to get it in the can. "While waiting for that magic-hour light, an executive producer asked me why we weren't shooting and wrapping the scene," recalls Hayes. "I explained that the light wasn't right yet."

In the meantime, Hayes had his gaffer Chris Ernst rig a 10K Fresnel and a 12x12 grid to help augment any fading magic-hour light, if the scene required it. To put everyone at ease, he also shot the scene a little earlier, "just to have it should something go wrong during the sunset," he explains.

"In a way, we treated the shoot like a Cassavetes film," Hayes says of the 15-day shoot, "lots of handheld shots with long takes to let the actors breathe. It was a task between me and them, as no take was the same, so scenes weren't monotonous at all."

Prentice Sinclair Smith also proved invaluable as Hayes' focus puller, bringing experience working as the right-hand guy to Matty Libatique, ASC. "Prentice was incredible," Hayes reveals. "So many pull focus from their monitor, and I hate that. I prefer my assistant cameraperson next to me, because we're making a movie together. If it's soft and someone is pulling from a monitor on the other side of the room, I can't just grab the barrel and correct it. But if my AC is pulling off the barrel next to me, then I can give them direction to correct it. I really love that intimate way of filmmaking."

Looking back on the shoot, Hayes champions all involved. "Casey had my back the whole time, and the



Emmy® Award-winning director Casey Tebo is recognized for his spectacular, high-energy concert films. *Happy Birthday* marks Tebo's first narrative film in the horror genre, a dark, psychedelic tale featuring Aerosmith rock legend Steven Tyler.

same goes for Sean," he explains. "They both understand and respect the process of filmmaking. Obviously, it's not, 'You can have whatever you want,' but it's collaborative. Producers are focused on wrapping at a certain budget, and that's perfectly understandable."

Color timing on the film was performed at Zandrak Productions in Boston with Andrew Hutcheson who, despite his newer status as a colorist, executed Hayes' notes perfectly.

"It's great to work with someone who helps bring images to the table that I've never created before," wraps Hayes on the collaboration. "He's someone with great ability that can enhance the story at hand."

Adds Hayes, "You don't want to simply inform an artist to, say, go more blue or add more contrast across the blacks. I'd rather go in and discuss the philosophy of the work, then allow them to take a crack at it. I might love it, or we might need to tweak things—but either way, it's a creative, collaborative relationship, and these are the things I love about making films." HDVP

You can learn more about the film by visiting Darko Entertainment at darko.com.



Christina Giovacchini



Christina Giovacchini



Leica Summilux-C Cine Lenses

With industry-leading focus scales, consistent lens dimensions through the range and corner-to-corner illumination across the Super 35 image circle, this 12-lens set of PL-mount primes is cinematic perfection

By David Alexander Willis



A 16mm has proven so popular that it's currently backordered through the year.

In February 2015, the development team behind the Leica Summilux-C range of PL-mount lenses received the Scientific and Engineering Award® from the Academy of Motion Picture Arts and Sciences for technical innovation. This, after only four years of existence, during which a number of productions embraced the prime lenses on such award-winning and big-budget films as *Birdman*, *Iron Man 3*, *X-Men: Days of Future Past*, *Gone Girl*, *Transformers: Age of Extinction* and *Dawn of the*

Planet of the Apes. Considering that CW Sonderoptic GmbH, the company behind the design, was only just founded in 2008, it might be shocking to some to see how fast the response has been from major studios and broadcast companies, but for those who know that the company was founded in 2008 by Dr. Andreas Kaufmann, majority owner of Leica Camera AG, specifically to develop a new lineup of lenses for cinematic capture that would bear the Leica name, the immediate success of the top-shelf

lenses starts to make a lot of sense.

In the still photography world, the Leica name is absolutely historic for its long lineage of high-quality glass and the Leica "look," with excellent skin rendition, subtle bokeh and superb, creamy sharpness. The new line of Summilux-C lenses, as in "cine," carries that tradition over to the world of cinema lenses, with an absolutely meticulous design that the company says is 100% handmade. Built in Wetzlar, Germany, at more than \$30,000 a lens, this attention to detail



shows not only in the optics, but also in the price, but these lenses are definitely marketed as a high-end rental house solution, and, in fact, CW Sonderoptic also came out with a similar, but more affordable line in the Summicron-C set of lenses, which debuted in December 2013 at less than half the cost.

So what does the Summilux-C offer that has gained it such renown in such a short time on the market, and how does the lens set differ from the Summicron-C line?

Special effort has been given to ensure that chromatic aberration is reduced even at the edges thanks to a telecentric design and multiple aspherical elements. Unlike the spherical elements found in the Summicron-C line, which can be built by machine, aspherical elements must be constructed and finished by hand. As such, the Summilux-C primes, available in a range that covers 16mm through 135mm, are designed for no focus falloff and even illumination across the entire frame, even with the aperture wide open to an extremely bright T1.4. To achieve this, each lens in the Summilux-C line houses between 18 to 22 individual lens elements, which also results in very smooth focal transitions without any breathing.

Aside from the optics, the construction of the bodies themselves is a feat of modern lens design, as well, with titanium PL mounts and advanced linear distance focusing scales that also incorporate expanded

focus mark spacing in the range of critical focus for very precise focus racking. (The Summicron-C line has a stainless-steel PL mount.) Focus scales and barrel dimensions have been matched across the entire line, which is a first for cinema lenses. From the newly announced 16mm to the 135mm, the Summilux-C set has a uniform barrel length of 142mm (5.6 inches), as well as a consistent front diameter of 95mm for quickly swapping filters or focal lengths without needing to reset follow-focus units or camera rigs. This can save a lot of time on a busy production, and focal and aperture rings also feature homogenous placement with 300° and 180° of rotation, respectively, for matched operational performance across the set. Minimum focusing distance for the majority of the line falls between a foot and two feet, with the rear filter holder also built into each lens. All of this in lenses that weigh between 3.5 and 4 pounds each.

Consisting of nine focal lengths ranging from 18mm to 135mm, the Summicron-C line is no slouch when it comes to imaging quality, either. The lenses are very similar in design to the Summilux-C set, with matched bodies and a universal front diameter of 95mm, but they're 20% lighter and also more compact. CW Sonderoptic saves cost on the Summicron-C line by employing a more conventional helix-style focusing mechanism, as well as through the use of spherical lens elements. They

also top off at an iris of T2.0, while the Summilux-C will open an extra stop to T1.4. Also, though most focal lengths are available in both lines, there are 16mm and 65mm focal lengths available only through the Summilux-C line.

Both lines of PL-mount primes can also be used with Leica M or Leica SL cameras through available adapters like the Leica M PL mount, also manufactured by CW Sonderoptic, or the ARRI PL-to-M models. Interestingly enough, the Summicron-C lenses all cover a 36mm imaging circle, while the Summilux-C models cover 33mm, big enough for Super 35mm-sized sensors, but just slightly short of full-frame sensors, which will vignette. Obviously, at this pricing, these lenses aren't built for DSLRs, on the other hand. There are four resellers in the U.S. (Band Pro, AbelCine, Duclos Lenses and Hot Rod Cameras). A full list of worldwide resellers can be found on the CW Sonderoptic website. (Due to orders from existing Summilux-C lens owners, the newer focal lengths of 16mm and 135mm are currently backordered. A few rental houses have them on hand, however, and a range of 18mm to 100mm is covered by lenses already in the wild.)

List Price: Summicron-C lenses begin at \$14,500; \$142,000 (Summicron-C 9-lens set); Summilux-C lenses begin at \$33,200; \$353,100 (Summilux-C 10-lens set, 16mm and 135mm not included). **Contact:** CW Sonderoptic, cw-sonderoptic.com.



Eleven top-notch primes comprise the Summilux-C cine lens family from Leica and CW Sonderoptic. A new 135mm has also been released.

BBS Lighting Pipeline Reporter And 4 Bank

Tough lights with high-quality rendering are the hallmark of a company concentrating on the energy efficiency and low-heat output of remote phosphor and LED solutions

By David Alexander Willis

You know a product is going to be good when you meet with a lighting company and the first thing they do is knock the bulbs sharply against a table to prove their sturdiness. BBS Lighting, which stands for Brother, Brother and Sons, is based out of Copenhagen. Concentrating on LED and remote phosphor lighting technologies, the company showcased their line at NAB in April, where I was able to see firsthand just how durable and versatile their lights are.

HDVP received the diminutive Pipeline Reporter for review. At a price point of \$849, this is a versatile and incredibly compact remote phosphor solution, and the kit is available in 3200K, 4300K and 5600K. The Pipeline Reporter includes two 1-foot fixtures, with a TLCI (Television Lighting Consistency Index) rating of more than 95 with all three color temperatures. Dimmable from 0-100%, light spreads out from the fixtures in a soft, diffuse half-circle, with an equivalent output of 1,000 lumens per foot while drawing a max of only 10W each.

Each light weighs only a half-pound, so they can be taped easily for placement. They also include very small, incredibly well-articulated Manfrotto desktop tripods that offer widespread leverage in positioning and lockdown. The 1/4"-20 threads are universally standard so the lights can be mounted to other systems.

The Pipeline Reporter includes a 100-240 VAC power supply with splitter to feed both lights via a 1/4"-20 tap. Unfortunately, the length of the splitter cable severely restricts how far apart you can place the lights. Extension cables and several powering options can be



David Alexander Willis

The low-heat, high-output and very compact BBS Pipeline Reporter remote phosphor lights, small and portable enough to be hidden in any scene.

purchased separately to improve the distance, however, and 14 VDC battery options are available, making them far more versatile for detail lights or for lighting up smaller areas in a scene.

The system comes with three plug adapters and an 11x15x4.5-inch hard-shell case with customized foam cutouts for travel and worldwide usage. The whole system is simple, but powerful, and ready to go right out of the box with setup that took only a minute. The fixtures are also silent and flicker-free. BBS has made single-bulb units

available in 1-, 2-, 3- and 4-foot lengths at a range of \$100 to \$300, including both wired and non-wired ends for use with other lighting systems or for tailoring the bulbs and power for your own needs. BBS offers a number of power options separately.

As the name suggests, the Pipeline Reporter is aimed primarily at ENG situations where reporters or location correspondents need portable lights that can be used when broadcasting from desktops or when using a computer to record video reports or to webcast. For

more advanced needs, the company has also announced an impressive new light bank system that merges LED bulbs and remote phosphor substrate into a single high-output light that has a soft, flattering spread.

The Pipeline 4-Bank is available in 3- and 4-foot lengths, delivering a high TLCI rating of 95+ and a life span of 50,000 hours. The bulbs are so tough because the aluminum flat channels have been dipped in phosphor that measures 1/10th of an inch in thickness, helping the bulbs to resist damage or breakage. Like the Pipeline Reporter, the LEDs are only an inch in diameter themselves. They output at more than 1,000 lumens per foot for a total of 12,000 lumens when using the 3-foot system and 16,000 lumens with the 4-foot light bank.

The 4 Bank lights are available in 3200K, 4300K or 5600K color temperatures, with a bi-color fixture that can use



The very affordable BBS Pipeline 4 Bank with high, flattering soft light output for professional cinematography.

the light banks to mix 3200K and 5600K to find any color temperature within that range. Each unit has a built-in 4-channel control with 8- or 16-bit DMX control, as well as manual dimming that provides a flickerless range from 0-100% without any color shift. The low-heat units run from a 48V power supply. Foil-lined softboxes and light grids have been customized for use with the Pipeline 4-Bank, too. The lighting fixtures can also be stacked to build a wall of light, as needed.

The 3-foot 4 Bank model starts at under \$2,000, while the 4-foot version begins at just under \$2,500. BBS also has several open-face LED fixtures, Fresnel units, pars and even a very cool \$2,999 Flyer LED Kit pole light, which is a small overhead diffusion source that can be used as a balloon-style light while requiring only a single operator to handhold. HDVP

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(Cont'd from page 72)

Beware of consumer cameras that don't allow you to get more than 8-bits out of the camera. Moving to HDR reproduction usually suggests increasing the color gamut because brighter scenes allow for brighter colors, while spreading the range of colors requires more levels of color to prevent contouring in subtle color shading, much like in brightness.

If you dig into techniques, you'll often find that cameras with similarly named approaches produce much different results. This doesn't necessarily mean that a camera doesn't do a better job than older models, but it might explain why the better cameras still cost more. The different approaches often show up in different applications.

For example, across camera types, HDR in still cameras usually means capture of two or more frames in sequence, each of which is optimized for a different range of brightness. The frames are then merged into a single frame that reproduces a wider range than either of the original frames.

In video, this technique is seldom used because of the impact on motion reproduction, motion blur and depth of field. The likelihood of creating visible artifacts would be much more visible in a motion sequence than in a single frame. Some consumer cameras use multi-frame techniques to get HDR. Others try to squeeze improved dynamic range out of tone mapping, which may run into noise problems.

Professional-level HDR generally emphasizes improved sensor performance (both in sensitivity and highlight overload handling), combined with new digital in-camera processing curves. In some cases, this can include dynamic curve application based on the output of each pixel or group of pixels.

If more flexibility in post is required, there are new record formats optimized for transferring that information, and recorders possessing greater capacity to maintain that range in postproduction. As always, there are various approaches available, and you have to decide which new format to choose.

As I study more, I find that HDR has specifically different connotations on the image capture side than on the



An example of "faux" HDR in Premiere Pro, where a consumer camera is used with non-HDR features in the NLE color-correction tools to simulate an HDR "look."

distribution side. You can develop an HDR "look," emphasizing the preservation of detail in shadows and in highlights by applying tools in-camera, or recording HDR video with more bits and creating the look in post.

These "front-end" approaches are targeted toward delivering standard dynamic range (SDR) video to display devices that reproduce up to a few hundred nits of brightness in a living room, or viewing room, with relatively low light.

The other side of HDR includes the capture in an HDR format, followed by a special workflow that needs special monitors for preserving more dynamic range throughout the distribution chain, all the way to HDR monitors that can produce over 1,000 nits of brightness in a well-lit room.

Getting HDR signals to an HDR display requires new formats and devices that can handle several stops of highlight information. Of course, legacy displays won't know what to do with the excess information and will need conversion back to SDR video at some point.

Once again, it's another transition, another product that may require multiple deliverables, and more confusing options for consumers. Are you ready for that?

Upgrading your workflow involves looking at the impact of managing larger files coming in from the camera, including additional time to transfer those files,

potentially larger and faster servers to handle those files, more powerful computers to ingest, convert, process and assemble the additional information, and larger archive pools to maintain the products and originals for future use.

HDR, HFR, sensitivity and color gamut advances are found almost daily in all levels of cameras. The high end and the low end are both improving so, regardless, you still have decisions to make. The performance or features that were acceptable last year might not cut it this year.

If you're now experiencing a sense of déjà vu, it could be because you lived through a similar experience when you moved from standard-definition to high-definition video production. But if you're entering a state of depression, it could be because you thought you had slain all these demons when you moved from film to digital video production.

Does it ever end? To be continued? You can bet on it; there's always more Misinformation and not enough time. HDVP

Charles "C.R." Caillouet is a technical producer and video engineer who has worked in TV production, from preproduction through field acquisition to postproduction and presentation, as well as for NASA, Sony and Panasonic. He's currently Technical Director of the Jackson Hole Wildlife Film Festival and Science Media Symposium.

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TIPS & TECHNIQUES

From the Pros

1 The Story Comes First

Shoot for the story, not your demo reel. While a complicated camera move may look exciting, if it doesn't serve the story, then there's no place for it. Don't be afraid of simple. Simple is your friend.

2 Learn How To Light

Light is your paint brush. Not only does it let viewers see the subject, but it creates mood and influences how the audience reacts to the scene. Educate yourself on the various types of light fixtures, the difference between hard and soft light, and the tools available to shape and manipulate it.

3 Know Your Gear

Before arriving on set, make sure you're familiar with the gear you'll be using. If you're a camera assistant, try to get your hands on the camera ahead of time or, at the very least, read through the user manual. Being prepared saves time on set, and we all know what they say about time.

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Is HDR What You Think It Is?

What high-definition-range capture brings to video

Text & Photography

By Charles "C.R." Caillouet

If you've been following releases from manufacturers, as well as standards work in imaging industry organizations, you may be wondering whether all the increases in resolution, dynamic range, color gamut and capture quality are worth the effort and the cost.

It's not just about 4K. It's high dynamic range (HDR) and high frame rate (HFR), too—and it's all getting so cheap!

Even though those prices for new equipment and software are falling, however, changes in technique and workflow require extra time for learning equipment and application features, testing new techniques for your particular shooting and editing environment, and additional time added to the workflow as you fumble through unfamiliar routines. You may also have to upgrade hardware and software, once again.

In addition to deciding whether to move to 4K or higher resolution, there are more decisions to make, like whether or not to get wrapped up in HDR imaging.

You may have noticed a trend here: I seem to spend a lot of time in this column trying to figure out whether each new, biggest and best advance is worth the time that it takes to integrate it into my workflow, whether it will make the production that I deliver to clients and viewers any better, and if it's technically better, whether they will even notice. If they do, which exact improvements will "wow!" them?



MYTH
More Is
Always
Better

When done professionally, HDR results in a massive increase to brightness. The Dolby Vision™ HDR projection system, for example, provides up to 31 foot-lamberts of luminance, while a typical theater experience will offer half that level of brightness at only 14 foot-lamberts. Here, Final Cut Pro X is used to create an HDR simulation with footage from a typical consumer camera.

The quest for HDR has been around for decades in one form or another. Gamma correction was introduced with tube-type cameras and cathode ray tube (CRT) displays as a rudimentary way of representing video in a form to match the response of the eye and reproduce viewable scenes on available displays of the day.

As sensors improved, they captured more dynamic range; quieter video amplifications reproduced more shadow information; and, knee or shouldering circuits compressed more of the highlights into the analog video signal. Brighter displays brought wider dynamic range to viewers. The move to digital processing allowed creative mapping of light levels in order to optimize scenes for lighting conditions and moods.

Linear light imaging would require more than 14-bits to reproduce the 14 stops of static illumination (15,000:1) that a healthy eye can handle, or 30 bits to reproduce the 30 stops of dynamic

contrast (1,000,000:1) that can exist in nature.

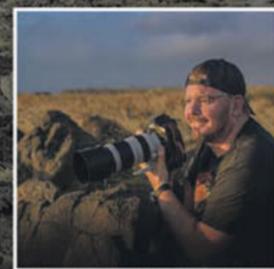
But with clever level translation using a gamma or log function akin to processing in the human eye, plus additional tweaking of the blacks and slope-shifting above a "knee" point in the highlights, we're now able to get a reasonable reproduction of 14 stops in about 10-bits—well within the reach of modern recorders.

If we want to preserve even more information, as is often required for post, our sensors need to be top-of-the-line, and we need to allocate more bits, perhaps 12 or even 16. Keep in mind that the human eye is capable of seeing up to roughly 24 stops, carefully adjusting to different levels of brightness, so dynamic range will vary by situation and even by person. The price of using fewer bits or weaker processing can be contouring in smooth gradations of brightness or color, like skies or solid backgrounds. Larger areas of fine detail or coarse textures will often hide contouring.

(Cont'd on page 66)

"To make maximum use of Canon's latest range of 4K cameras you need a CFast card. For performance and reliability, I only use SanDisk Extreme PRO CFast 2.0 cards."

Vincent Laforet
PULITZER PRIZE
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¹ 4K video (4096x2160p) support may vary based upon host device, file attributes and other factors. See www.sandisk.com/HD

² 1GB=1,000,000,000 bytes. Actual user storage less.

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up to 35lbs



CP MICRO
up to 12lbs

***NEW FOR
2016***

CP Track Drive



Frame-Accurate Motion Control



**Jibstick
Jr**

**Jibstick
Pro**

***4-head/28-axis
control console***

**Encoded
Pan Bars**

Hand Wheels

Controllers pictured above work with all CP heads

Cranes

All Sizes
& Budgets



**SnapCrane
w/ CP Micro**

VariZoom Motion Control is Precision-Made in the USA

Used On: SuperBowl, IndyCar, Mad Max, Rush, Divergent & many other productions

www.VariZoom.com

512-219-7722

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