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CODEx

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FRASER & FAVREAU TAKE THE NEXT STEP ON THE MANDALORIAN

Virtual Backgrounds Return Control to the Set.

In 2013, Alfonso Cuarón's *Gravity* was testing the limits of filmmaking technology. To take audiences to space, Cuarón and director of photography Emmanuel Lubezki filmed Sandra Bullock inside a box made of LED panels. Cuarón and Lubezki each took home Academy Awards, among seven total Oscars for the film.



**THE LED VOLUME
RESTORES VISUAL
POWER BACK
TO THE
CINEMATOGRAPHER
AND THE DIRECTOR
ON THEIR OWN SET.
TO ME, THAT'S THE
MOST POWERFUL
PART OF THIS**

Greig Fraser, ASC, ACS

Jon Favreau advanced similar techniques on *The Jungle Book* and *The Lion King*. The LED-screen backdrops used to cast interactive light in *Gravity* had reached the point where they could be used for entire on-camera environments. The virtual production techniques depended on an LED 2.8 millimeter pixel pitch, down from the 9-mm pitch used on *Rogue One: A Star Wars Story*, where the backgrounds were later replaced with higher-resolution imagery.

On the production of *The Mandalorian*, the first live-action web TV series in the *Star Wars* universe, Favreau teamed with director of photography Greig Fraser (*Lion*, *Snow White and the Huntsman*, *Zero Dark Thirty*, *Foxcatcher*, *Mary Magdalene* and *Rogue One*). Co-shot by Barry Idoine, the Disney+ series – sometimes termed a Space Western – depicts a lone bounty hunter who operates far from any authority.

To take virtual production to the next level, ILM worked with Epic Games to adapt their Unreal Engine to enable real-time display at resolutions sufficient to make replacement unnecessary. Ironically, some of ILM's original assets were brought out of the library and used, making a visual link to the earlier *Star Wars* imagery. Fraser says that one key to working with cutting-edge tools is to make sure they don't become an end in themselves.



"If you base your decision on the technology side of things, that's the tail wagging the dog," says Fraser. "The technology is purely there to serve us as filmmakers. These tools often have to go through a process of adaptation. I want to be able to move the camera. I want to choose where the camera goes on the day – even in the moment that we're shooting. Perhaps an actor does something different, and I do a little tracking to save the shot – and that becomes the magic part of the scene. So, we can't run it like a robot. It's not just committing a storyboard to film. It's an organic process – that's the exciting part."

"It's been brewing for a number of years," says Fraser. "We did all the testing on *Rogue One*, and it was very much a conversation – could we do this with a real environment, and not just with ships in space? The answer was 'not quite yet.' We had moiré and other issues. Now it's five years later. It was like a meeting of the minds. Jon was willing to risk writing the show based on the premise that we could shoot almost anything on the LED volume. It was a big step, and everyone put their reputations on the line. I can tell you it was one of the most beautifully stressful shows that I've ever worked on, because we were walking into the unknown."



Fraser says that these decisions affected every aspect of the shoot, beginning on day 1 of prep. "Early on, it occurred to me that we were making 40 or 50 decisions every day that were brand new and groundbreaking," he says. "Of course, you still have the standard general decisions that have worked their way through a century of filmmaking – What direction are we shooting? How do we stage this? But I was learning so much about the LED screen process, the manufacture, indoor versus outdoor, output, bit rates, dimming. And the LEDs were merely one aspect. There are hundreds of factors that we were navigating daily. As adults, it's rare that we are learning on such an intense scale. It's a fantastic feeling. But this was extreme. Every day when I went home, my head literally hurt! We were essentially inventing a new process of shooting."

Fraser chose to shoot on ARRI ALEXA LF cameras in ARRIRAW capturing to CODEX Media. He chose the Panavision Ultra Vista lenses, which use a 1.65x squeeze to produce a 2.35:1 aspect ratio. The resolution was roughly a wash compared to the ALEXA 65, which would have required cropping left and right on the bigger sensor. Digital Imaging Technician Eduardo Eguia made sure that the workflow wasn't a distraction.



Working with the LED volume brings control back into the hands of the cinematographer, according to Fraser. Since the dawn of the digital revolution, it seems, each step forward diluted the control directors of photography exercised over the image. Here, Fraser was able to work very closely with production designer Andrew Jones on every aspect of the backgrounds, not least the angle, intensity and quality of the light.

"The worst thing about being a cinematographer on a blue screen set is that you have literally no control over what goes on that blue screen," he says. "You have to trust the visual effects supervisor and the director, and in most cases, of course, you do. But maybe somebody doesn't understand framing, and they put a light post right behind the main actor's head. You may not have shot something in a certain way if you had known what the background was going to be. But the LED volume restores visual power back to the cinematographer and the director, on their own set. To me, that's the most powerful part of this."

Fraser has been busy since *The Mandalorian* wrapped, shooting *Dune*, a feature directed by Denis Villeneuve, also "Captured on Codex" with the ARRI ALEXA LF, and was currently working on *The Batman* with director Matt Reeves until production was recently halted due to the COVID-19 crisis. That film is still planning release in June 2021.



Director(s): Dave Filoni, Rick Famuyiwa, Deborah Chow, Bryce Dallas Howard and Taika Waititi
DP(s): Greig Fraser, ASC, ACS (Season 1) and Baz Idoine (Season 1 & 2) with Matthew Jensen, ASC (Season 2)

DIT: Eduardo Eguia

Camera Rental: Panavision

VFX supervisor: Richard Bluff

Camera: ARRI ALEXA LF with ARRI ALEXA Mini LF added in Season 2

Lenses: Panavision Ultra Vista

Format: ARRIRAW

Resolution: 4448x3096



MEDIA VAULT TAKES CENTER STAGE ON A SOUTHERN GOTHIC TALE

With our recent catch up with Jason Starne, Producer and Post Supervisor, he shared with us how valuable the CODEX Media Vault was in the production of WHITETAIL.



Jason expands on the tools that were used to build a workflow around CODEX's shared storage solution that allowed the entire production to collaborate with editorial, color, VFX, marketing, and music/sound finishing for the 2-hour Southern Gothic narrative.



**THE EXPERIENCE
HAS BEEN
AMAZING, BEING
ABLE TO KEEP ALL
THE DATA IN A
SINGLE SHARABLE,
PORTABLE
CONTAINER**

Jason Starne
Producer and Post Supervisor

"As a Producer and Post Supervisor, I must say having the Media Vault onset was crucial while making the film WHITETAIL," says Starne. "I knew very well about CODEX for its work with ARRI, but what about RED? Could we still take advantage of the Media Vault even if we weren't using High Density Encoding? HDE would have been nice since we were shooting with 2 RED Weapon cameras, each capturing at 6k anamorphic with a 2X squeeze, from a 6.5 sensor crop (2:35:1 Widescreen), using only 5:1 compression. Thanks to Director Derek Presley's meticulous shot planning and storyboards, we only ended up with 10.4 terabytes total of Original Camera Native files (OCN) for the 12-day shoot.

WHITETAIL follows a broken family consisting of a father, an uncle, and the father's 15-year old son Donnie as they embark on a weekend hunting trip out in West Texas. Donnie's mother has recently died of an overdose, and the trio hopes to get away from it all by being out in nature. Instead, they find a mysterious man, shot in the stomach, and clutching onto a backpack full of money. Who shot the man? Where did the money come from, and how long will they survive while criminals are all out looking for the cash?



"The production workflow was simple. The A Camera utilized DSMC2 and we were able to generate QT ProRes proxies directly in-camera, while the B Cam was only the DSMC1. We relied on Adobe Media Encoder for transcoding the R3D files to 1920x788 QT ProRes proxy files to match the A Cam proxies.

"Each day as we broke for lunch, the data loader would ingest around 500-600 GB of OCN from the RED mags to the Media Vault, which never took more than 30 minutes due to the direct connected 10Gb Ethernet from the DIT's Windows-based laptop. After the transfer of the B Cam data, we would immediately start generating proxies while our 1st AC would use the second set of mags for the rest of the shoot. At the end of each day we would swap mags and ingest another 500-600 GB of new R3D files and then be camera ready for the next morning. Plus, editorial would have everything they needed from the previous day ready to cut in Adobe Premiere.

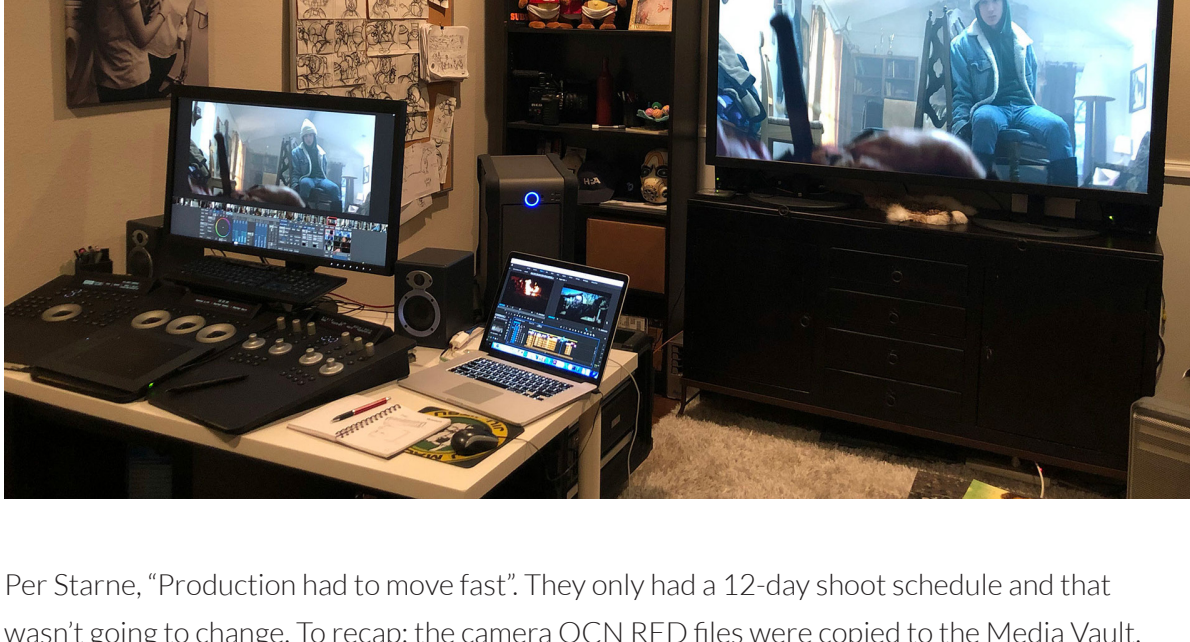


"The Media Vault comes standard with four 10Gb Ethernet ports. In addition to the DIT loading the RED mags directly, we were even able to have the BTS (Behind the Scenes) team ingest images and video through a MacBook Pro laptop attached via a Sonnet Echo express unit utilizing the 10GbE network connection. The BTS laptop was running Adobe CC, and the BTS team managed the occasional PhotoShop and Premiere cuts for social media. All of this was happening while the senior editor worked on the main scenes without any hiccups or slowdowns. The editorial station, provided by CineSys-Oceana, was a PBW (Purpose Built Workstation), operating Windows 10 Pro, with an Intel i9 14-core 3.2GHz/4.4GHzTurbo chip, 128GB of RAM, and the Nvidia RTX2080 GPU with onboard RJ45 10GbE copper connections.

With the R3D files stored on the Media Vault and the extra workstation horsepower, we would often play with the ISO and Kelvin settings in Premiere for some look experimentation. The whole setup allowed the editor to quickly review takes and QC the scenes for continuity and lighting setups during the entire shoot."

Post Workflow

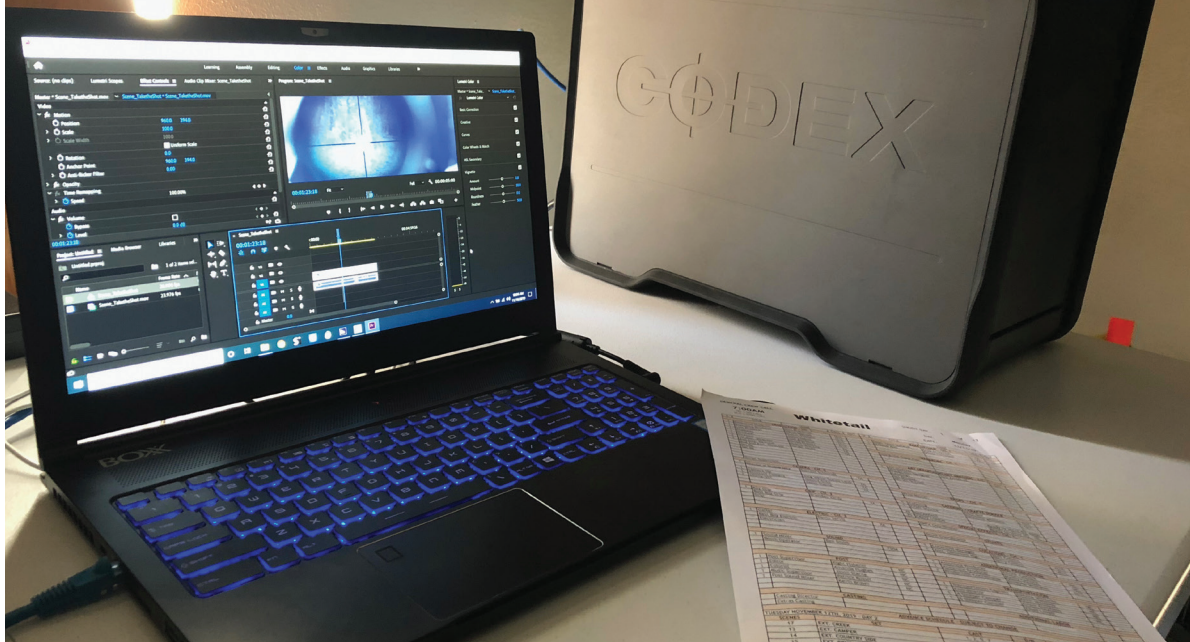
"To quote Benjamin Franklin, "Failing to Plan is Planning to Fail" and since the beginning of the WHITETAIL project, the director and team had a very meticulous plan," states Jason. "As we know from the production side, the entire production relied heavily on the Media Vault for all camera RED file transfers and proxy creation. This allowed the senior editor, Amanda Hughes, to begin assembling scenes right away in the make-shift edit suite, which was actually a bedroom in the house that a third of WHITETAIL was actually filmed in". "At times the editor would be reviewing footage and assembling scenes, all while the director was watching his monitor with the focus puller, allow them to do their jobs respectively at the same time. It got a little tight for sure, but the Media Vault proved the importance of having quiet gear onset".



Per Starne, "Production had to move fast". They only had a 12-day shoot schedule and that wasn't going to change. To recap: the camera OCN RED files were copied to the Media Vault. Proxy transcodes for the RED Dragon Cam B were created through Adobe Media Encoder accessing the Media Vault through a second laptop. Red Cam A proxies were created in camera due to a DSMC2 brain. Adobe Premiere was the tool of choice for editorial because "the relinking feature is so effortless, and the AAF export just conforms perfectly in Autodesk Flame, the online and finishing choice for VFX and final color."

The shoot ended the day before Thanksgiving and although there were challenges, it all came together. Production packed up the onset gear and portable Media Vault and moved to Jason Starnes' home office where editorial would continue through the month of December. Now acting as Post Supervisor, Jason said, "Believe it or not we had a picture lock by the end of December".

The Editorial setup was configured with two laptops (edit and assist stations) running Adobe Premiere Pro. Autodesk Flame for Visual Effects with Autodesk Lustre 2020 were used for the online and color on a powerful purpose-built workstation provided by CineSys-Oceana. Taking advantage of the 4 direct connect 10Gb Ethernet ports on the Media Vault, the colorist and VFX team experienced excellent throughput to handle the post workflow. After final picture lock, the Adobe Premiere AAF was sent to the Autodesk Flame system which conformed the camera OCN RED R3D files at full 6K debayer on the fly coming straight from the Media Vault.



The VFX shots were packaged and sent over to Charlie Uniform Tango for the VFX work and to allow them to do their magic. The color grading was started in Autodesk Lustre 2020 and rendered back into the Autodesk Flame timeline. After picture lock the offline was sent over to the music composer Patrick Russell, and another offline copy with original audio and an OMF export was sent to Kevin Brown, at KDB Entertainment, who handled the sound design and dialogue editing.

"The experience has been amazing, being able to keep all the data in a single sharable, portable container. We already have another project in the works, and we know that CODEX Media Vault will take center stage!"



Camera Type: RED Weapon
Director: Derek Presley
Director of Photography: Garrett Schwindt
Post Supervisor: Jason Starne

MANDY WALKER, ACS, ASC CENTER FRAMES A MYTHICAL TALE

PIX ensures everyone is on the same frame!



Mandy Walker, ACS, ASC brings a unique perspective to her work. After the success of *Hidden Figures*, a period piece that garnered three Oscar nominations including Best Picture, Walker turned her eye to *The Mountains Between Us*, a wilderness adventure directed by Hany Abu-Assad. That film was her first foray on the large-format ARRI ALEXA 65 camera, a tool she chose again for her most recent project, a live-action version of Disney's *Mulan*. Walker is known for shooting film when appropriate – *Hidden Figures* was shot on 35 mm emulsion – but she says that the A65 was the right choice for *Mulan*'s epic, mythic tale. The story follows a fearless young woman who disguises herself as a male warrior in the Chinese army in order to save her father from fighting.



AND WE HAD
PIX, WHICH IS
GOOD FOR
CHECKING
CONTINUITY
WHEN YOU'RE
ON-SET, AND
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THAT SECOND
UNIT IS ON THE
RIGHT TRACK

Mandy Walker, ACS, ASC

We looked at other versions of this tale, including the original poem, Walker says. But we wanted a fresh look at the story for a more modern, wide-ranging audience. The first thing the director, Niki Caro, said to me was that the film is centered around the character of *Mulan*. It's her story, the story of a young woman discovering her power and strength. At the same time, it's an epic tale with sweeping landscapes and vast battles.

On *The Mountains Between Us*, in the snow in British Columbia, the ALEXA 65 performed so beautifully, she says. It looks incredible on the big landscape shots, but it's also a very intimate camera because of the lower depth of field. When you're close to a character, it has the most beautiful portraiture look. That's why I love it.

Lenses were chosen with similar priorities in mind. For wider shots, Walker used Panavision Sphero 65 glass, but for closer portrait shots of *Mulan*, she asked Dan Sasaki of Panavision to create a custom 85 mm lens based on Petzval Portrait lenses, developed in the mid-1800s for use with daguerreotype exposure and considered to be the first lens designed for photography. Its distinctive character includes significant field curvature and astigmatism, but the images are rendered sharp in the center. It gives the effect pulling the subject out of the frame without using extremely shallow depth of field.



"Chinese architecture is often based on symmetry," says Walker. "And Chinese art and painting is often composed with central framing, which all influenced our decision to center *Mulan* in the frame. I also had a lens built, based on a gaussian lens, that worked with the 65 mm sensor and a 2.39 extraction. We used that for special moments when *Mulan* is showing her elite warrior skills. It's a radial effect with chromatic aberration, which centers her and de-emphasizes everything else."

The additional picture information captured by the ALEXA 65 sensor didn't slow down the production – in fact, Walker could control the dailies process even more carefully. DIT Chris Rudkin used the CODEX Vault XL with the ALEXA 65 to keep the data wrangling invisible to Walker. "The digital workflow didn't affect me at all," says the cinematographer. "It worked really smoothly, and that's the way it should be. If anything, you get more running time before changing cards than you'd have with film magazines."



"We would break the footage in the middle of the day so the dailies colorist could start on what we'd been doing during the day and view by the time we wrapped. That was a big help. We could check everything, including what second unit were doing in real time in China on Moxian, which was helpful when we were working in remote locations on the South Island in New Zealand. I like to see things at higher resolution, and we had PIX, which is good for checking continuity when you're on-set, and making sure that second unit is on the right track. And the studio and all the department heads were on PIX, too – it's a good way for everyone to be on the same page."

As she does with film, Walker's practice is to overexpose by about 2/3 of a stop. When shooting digital, she brings the image back down in the CDL. "When I get into the DI, I have information in the shadows," she says. "As long as I'm protecting the highlights, I'm allowing for more information."



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IF ANYTHING,
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RUNNING TIME
BEFORE CHANGING
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HAVE WITH FILM
MAGAZINES

Mandy Walker, ACS, ASC

"That helps the visual effects collaboration, too," she says. "Niki and I worked closely with VFX supervisor Sean Andrew Faden on background plates, reference plates, and the mapping of our lenses. We did a look bible, which was a reference for VFX as well as for Natasha Leonnet, the DI colorist. It all goes back to the relationships – you have to be on the same page to work and collaborate together."

"Still, shots were always done in-camera when possible. Yifei Liu, who plays *Mulan*, is very talented and did most of her own stunts," says Walker. "Instead of trying to avoid the stunt person's face, we would put three cameras on her to make sure the audience can see her face in key moments. I think you feel that when you're watching the film. After the initial shock of digital's invasion of filmmaking over the past 25 years, is mature technology finally swinging image control back towards the director of photography?"

"When the DI first came in, people would say, Well, I don't need to worry about cutting that shadow or balancing the background – I'll do that in post," says Walker. "I try to be very disciplined on the set and not leave things until later, especially on a film like this, because it looks more realistic. Also, I need the time in DI to refine the color and contrast rather than making fixes. These days, I'm starting from

a much simpler LUT. I suppose that attitude comes from film – I know if I have a very simple LUT and a consistent base, I can adjust it from there and I'm not getting too complex in the color space. I try to only put basic changes in the CDL on-set, and then it transfers to the dailies. It's a simpler move than applying it to a complex LUT that doesn't always transfer for every lighting situation and can become twisted."

Walker is currently prepping her next project, which will be directed by Baz Luhrmann and is about the life of Elvis Presley. She plans to capture on CODEX using the ARRI ALEXA 65.

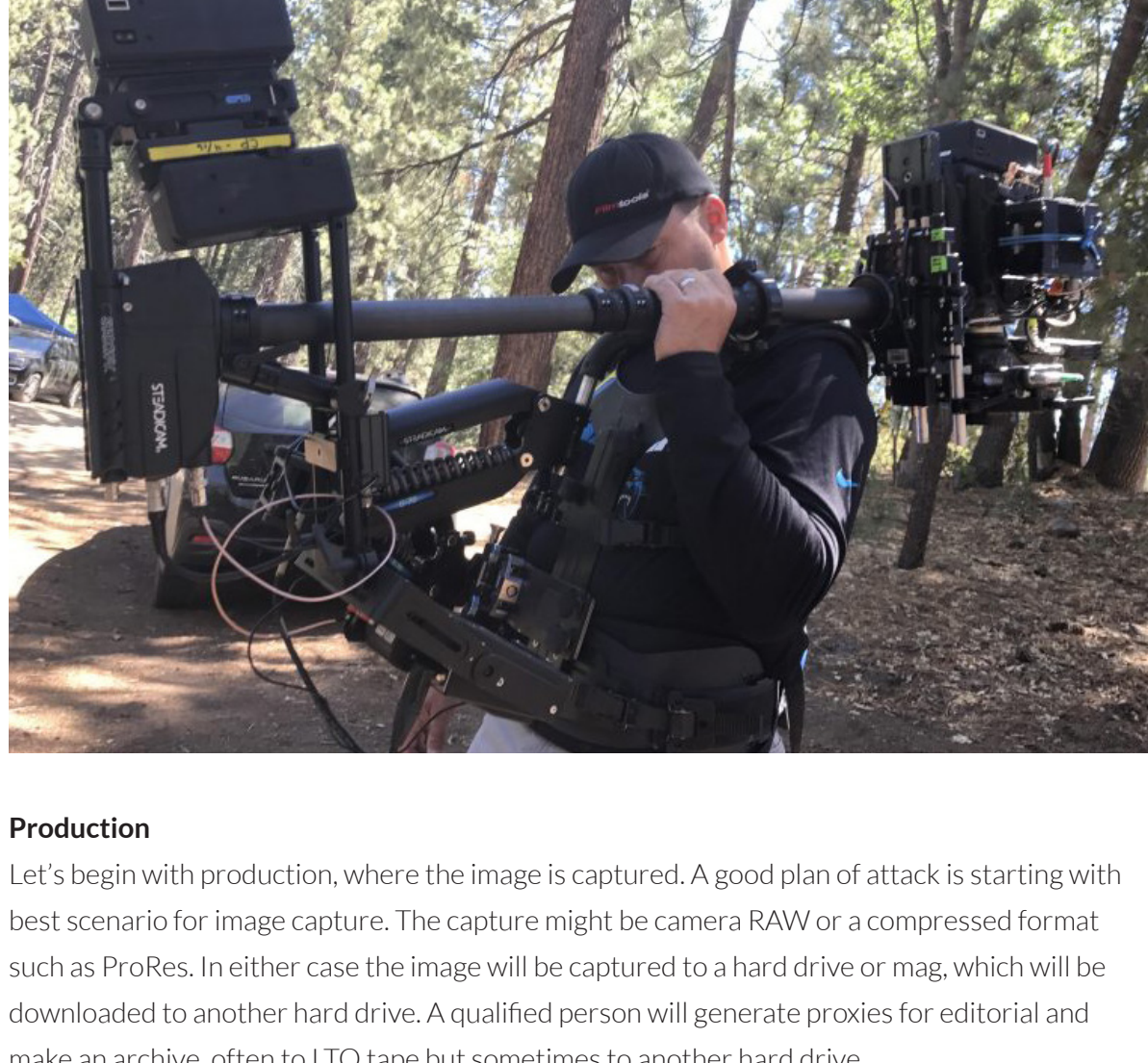
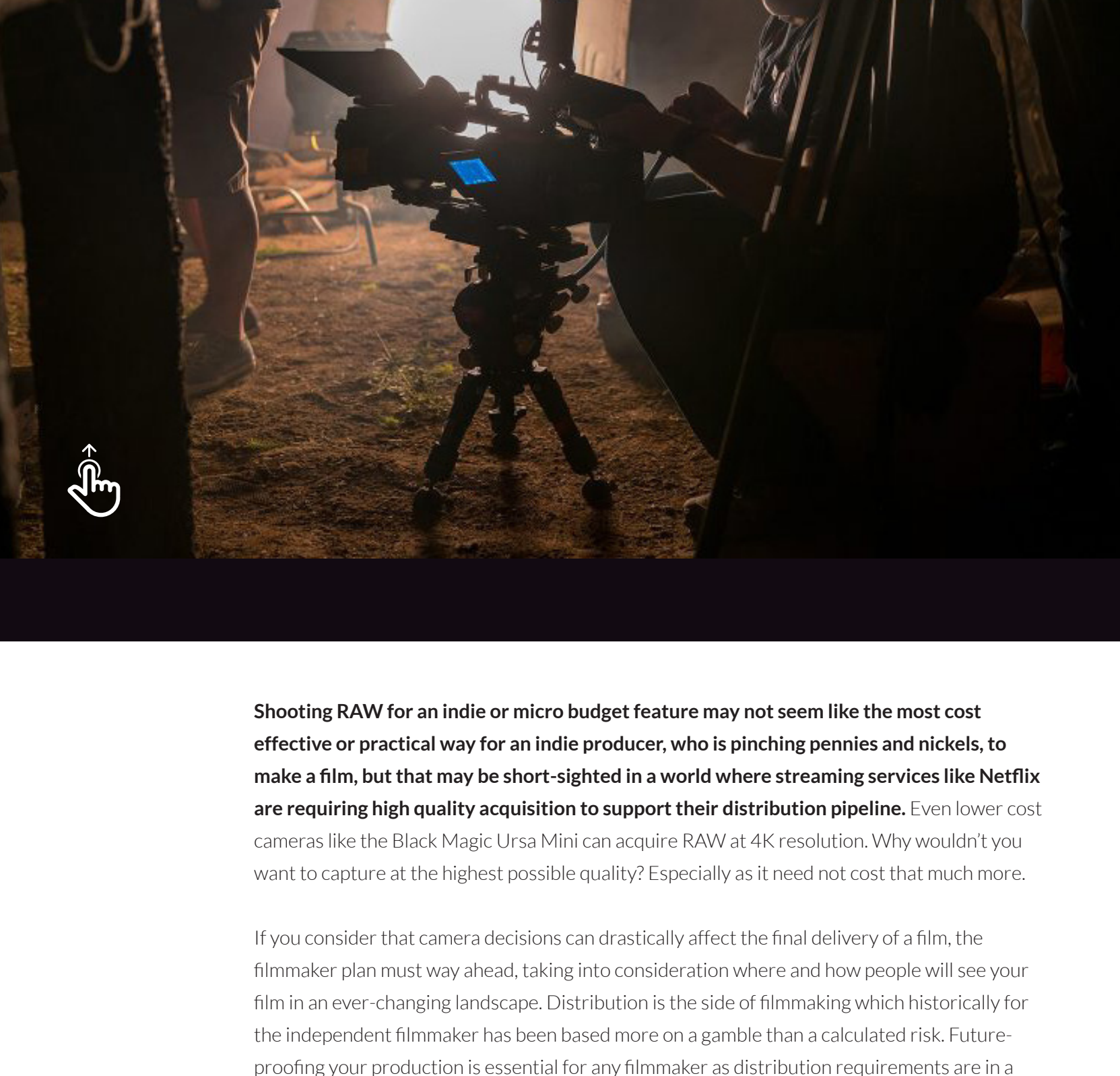
Mulan's theater release has been postponed worldwide due to the Coronavirus outbreak.



Director: Niki Caro
DP: Mandy Walker, ACS, ASC
DIT: Chris Rudkin
Camera Rental: ARRI Rental
VFX supervisor: Sean Andrew Faden
Digital Intermediate: Natasha Leonnet
Camera: ARRI ALEXA 65
Lenses: Panavision Sphero 65, Panavision Custom 85
Format: ARRIRAW
Resolution: 6560 x 3100 Open Gate

CAPTURING RAW ON A BUDGET

When most film professionals consider shooting RAW, they think about big budget movies, perhaps shot on a camera like an ARRI ALEXA, a Panavision DXL, a RED Weapon or a Sony Venice.



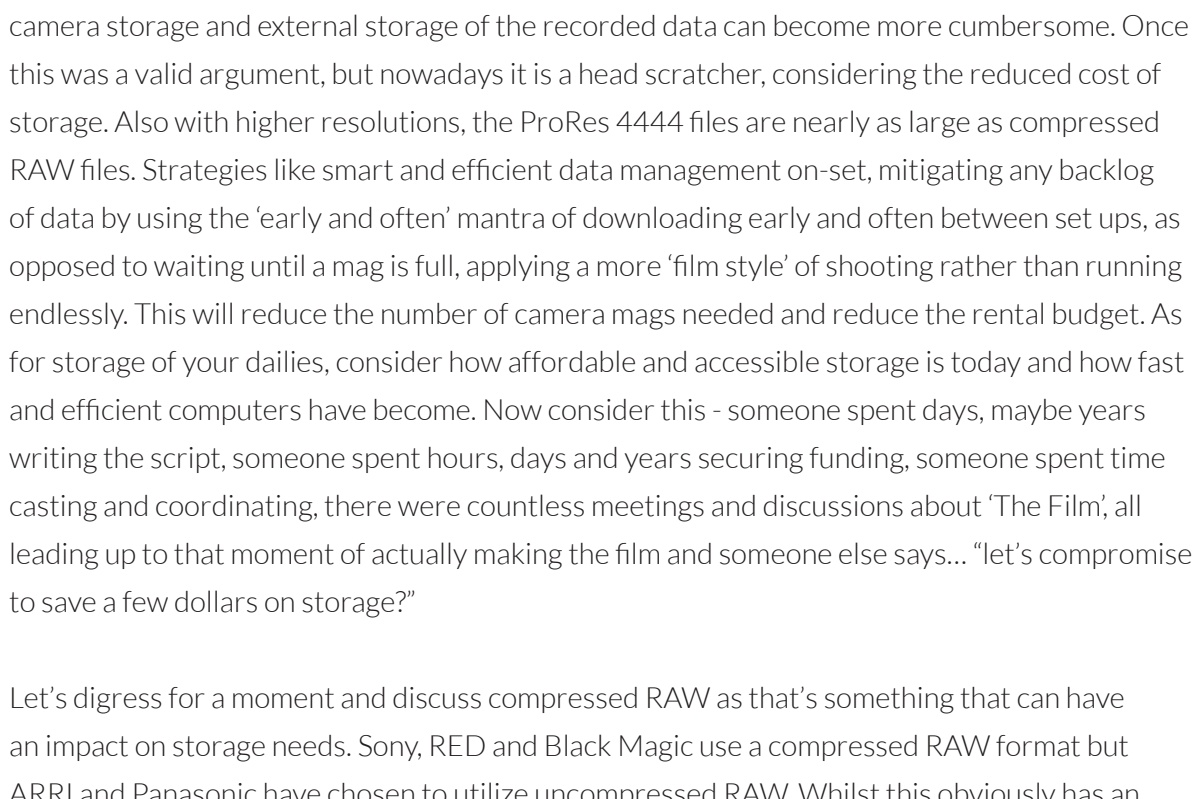
Production

Let's begin with production, where the image is captured. A good plan of attack is starting with best scenario for image capture. The capture might be camera RAW or a compressed format such as ProRes. In either case the image will be captured to a hard drive or mag, which will be downloaded to another hard drive. A qualified person will generate proxies for editorial and make an archive, often to LTO tape but sometimes to another hard drive.

What you get with camera RAW is the highest quality the camera is capable of producing. No processing, no image manipulation (except for data compression in some cases), the least chance for any problems. RAW is the unprocessed light information that is hitting the sensor. Shooting RAW moves the image processing from the camera to a workstation, reducing the chance for data loss and maximizing image quality. And you can choose where in your workflow it occurs and which tool you use to do it with.

A quick explanation of debayering – a term that you'll hear in any discussion of RAW capture and processing. An ARRIRAW file, for example, requires debayering because it's a single channel image representing the raw Bayer pattern readout from the sensor. One way to think of RAW is as a digital negative. And like a film negative, it requires processing to convert the single channel image into a color image suitable for viewing. Dr. Bruce Bayer of Kodak patented the Bayer pattern in 1976, mimicking the color sensitivity of the human eye, which is not equally sensitive to each color. 50% of the sensor's photosites are used to represent green, 25% of the photosites represent red and the remaining 25% represent blue. Debayering is the processing of the RAW image whereby a color reconstruction algorithm calculates the missing components for each pixel. Now here's the cool thing, and a great reason to shoot RAW – debayering algorithms vary and have already improved over time. So, once you've shot RAW, you've got a digital negative that you can go back to in the future and it could look even better.

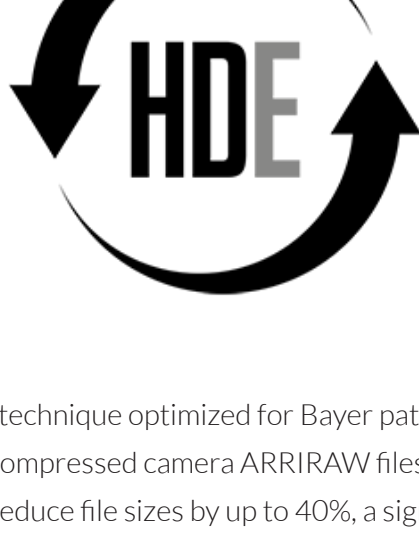
Technical advances mean that the differences between shooting RAW and an RGB format like ProRes have lessened over time. But if you can shoot RAW and utilize an efficient workflow so the cost differences are negligible, why not do it? Why not use the RAW image from the camera sensor with no file conversion or transcoding? Even if the image quality differences are negligible, there may be advantages in how noise, edges and out of gamut color are handled. It's hard to predict whether any of these will apply on a particular production but why take a chance? And as mentioned above, debayering techniques are improving over time and are usually backwards-compatible so you might be able to take advantage of them in the future, perhaps if you need to re-master for HDR or an as yet undiscovered display technology. Of course, these are all decisions that should be thought through prior to shooting and budgeted accordingly.



Storage

The most common argument against capturing RAW is file size and the expense of storage. Both camera storage and external storage of the recorded data can become more cumbersome. Once this was a valid argument, but nowadays it is a head scratcher, considering the reduced cost of storage. Also with higher resolutions, the ProRes 4444 files are nearly as large as compressed RAW files. Strategies like smart and efficient data management on-set, mitigating any backlog of data by using the 'early and often' mantra of downloading early and often between set ups, as opposed to waiting until a mag is full, applying a more 'film style' of shooting rather than running endlessly. This will reduce the number of camera mags needed and reduce the rental budget. As for storage of your dailies, consider how affordable and accessible storage is today and how fast and efficient computers have become. Now consider this - someone spent days, maybe years writing the script, someone spent hours, days and years securing funding, someone spent time casting and coordinating, there were countless meetings and discussions about 'The Film', all leading up to that moment of actually making the film and someone else says... "Let's compromise to save a few dollars on storage?"

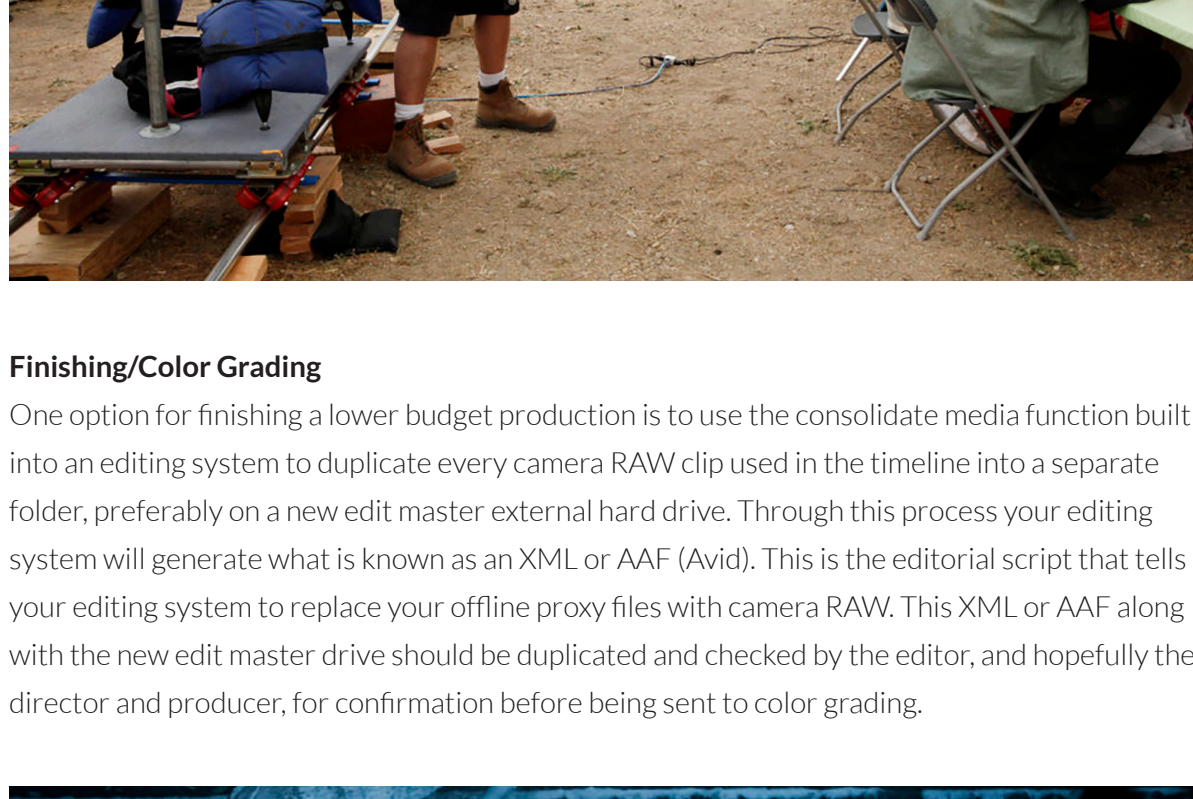
Let's digress for a moment and discuss compressed RAW as that's something that can have an impact on storage needs. Sony, RED and Black Magic use a compressed RAW format but ARRI and Panasonic have chosen to utilize uncompressed RAW. Whilst this obviously has an impact on file sizes and storage needs – for example, for an hour of footage, the RAW formats (ARRIRAW and VRAW) require around a terabyte of storage whereas the compressed RAW formats (REDCODE, Sony XOCN and BMRAW) require around half a terabyte per hour. But, given the cost of storage, this shouldn't deter anyone from shooting an uncompressed RAW format, especially given technical breakthroughs like Codex's High Density Encoding (HDE).



HDE is a lossless encoding technique optimized for Bayer pattern images and provides bit-exact data reduction of uncompressed camera ARRIRAW files from cameras like those in the ARRI ALEXA family. It can reduce file sizes by up to 40%, a significant reduction that can make shooting ARRIRAW more cost-effective and efficient.

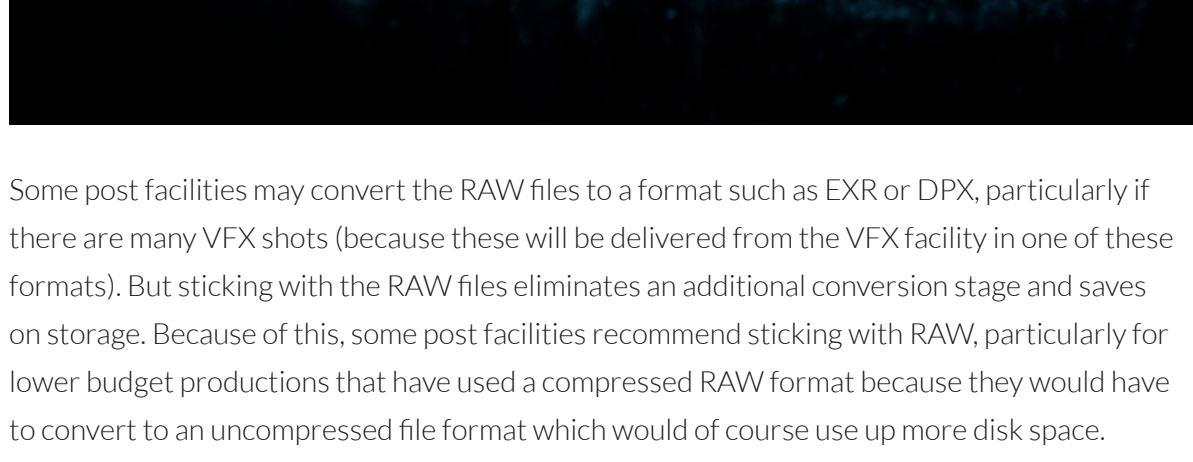
Editing

The process of editing is almost identical from one film to the next, no matter what the camera original files are. If, for instance, you do choose to capture camera RAW, from that RAW file a proxy can be generated to meet the creative needs of the editor and limitations of their particular system. You could choose to edit in standard definition (480P) if you wanted to, but more than likely something like a 422LT (1920P) HD proxy is suitable for most. When the RAW file is transcoded to a usable QuickTime edit format, the metadata from the camera as set by the cinematographer can be carried over and the general 'look' of the film can be seen from day one in the edit suite. That same metadata is always accessible through the post pipeline even as a guide through final color if transcoded properly and managed accordingly. Editorial shouldn't really be concerned with shooting RAW so much as just making sure all the files are organized properly. Editorial is typically the most compressed of all images as the entire movie and versions are stored with the editor. Starting from RAW versus ProRes, the images in editorial are sharper.



Finishing/Color Grading

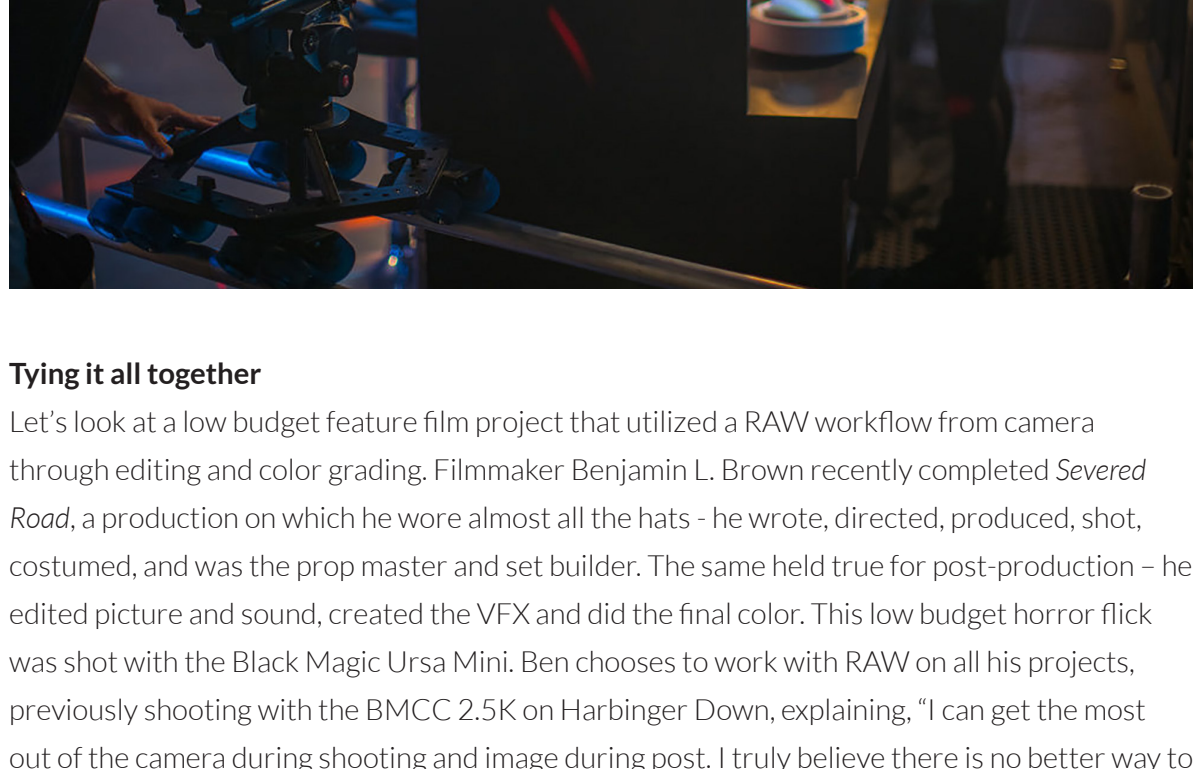
One option for finishing a lower budget production is to use the consolidate media function built into an editing system to duplicate every camera RAW clip used in the timeline into a separate folder, preferably on a new edit master external hard drive. Through this process your editing system will generate what is known as an XML or AAF (Avid). This is the editorial script that tells your editing system to replace your offline proxy files with camera RAW. This XML or AAF along with the new edit master drive should be duplicated and checked by the editor, and hopefully the director and producer, for confirmation before being sent to color grading.



Some post facilities may convert the RAW files to a format such as EXR or DPX, particularly if there are many VFX shots (because these will be delivered from the VFX facility in one of these formats). But sticking with the RAW files eliminates an additional conversion stage and saves on storage. Because of this, some post facilities recommend sticking with RAW, particularly for lower budget productions that have used a compressed RAW format because they would have to convert to an uncompressed file format which would of course use up more disk space.

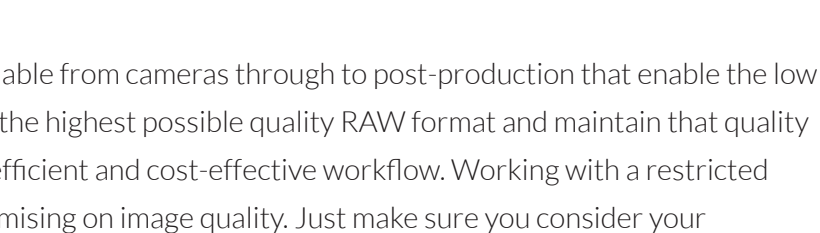
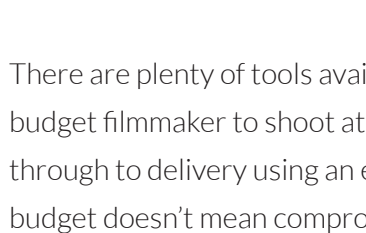
Distribution

Hopefully your goal is to make a film that gets distributed and seen by millions of adoring fans, or at least that's what your best boy this cool film he's working for around hour 16 when he was texting his aunt in Sheboygan, WI about this electric film he's hoping on. Distribution is important and something few filmmakers consider and a great argument for the 'best foot forward mantra'. You have to think about the endgame and that includes QC by distributors. In a recent Indie Film Hustle podcast, host Alex Ferrari lamented the quality control inspection of films for distribution on many streaming and theater platforms, his personal experience is wrapped up here: "QC is easily one of the most heart-breaking and brutal parts of the post-production process. When you think you are finally done you get the QC report back to find you have a lot of work to do. From a dead pixel in Camera B, to copyright material in a shot, to color shifts... it seems to never end. Please for the love of God spend the money on a good post-production supervisor so he or she can catch many of these issues before you get to QC. It will save you money, time and sanity."



Tying it all together

Let's look at a low budget feature film project that utilized a RAW workflow from camera through editing and color grading. Filmmaker Benjamin L. Brown recently completed *Severed Road*, a production on which he wore almost all the hats - he wrote, directed, produced, shot, costumed, and was the prop master and set builder. The same held true for post-production – he edited picture and sound, created the VFX and did the final color. This low budget horror flick was shot with the Black Magic Ursa Mini. Ben chooses to work with RAW on all his projects, previously shooting with the BMCC 2.5K on *Harbinger Down*, explaining, "I can get the most out of the camera during shooting and image during post. I truly believe there is no better way to shoot." Because of all the tools it includes, Black Magic Design's DaVinci Resolve was the obvious choice for post – Ben used it for editing, color grading and delivery.



Learn more about Ben and his work here - www.oddioworks.com

There are plenty of tools available from cameras through to post-production that enable the low budget filmmaker to shoot at the highest possible quality RAW format and maintain that quality through to delivery using an efficient and cost-effective workflow. Working with a restricted budget doesn't mean compromising on image quality. Just make sure you consider your workflow from camera through to delivery before your first frame is captured.

Thanks to Jimmy Matlosz and Benjamin Brown.



WORKING REMOTELY WITH MEDIA VAULT

The mobile, shared storage solution proves its worth through challenging times for the creative team at Future Time Pictures.



CODEX recently caught up with Pd Hardy, accomplished editor at London-based Future Time Pictures, who has worked on a wide variety of behind-the-scenes projects including documentaries, short films, and digital content. He is a creative and versatile editor who is extremely proficient with Avid MC and the entire Adobe Creative Suite. Pd's skills incorporate editing, color grading, motion graphics and sound design.



CODEX had a chance to learn how its Media Vault shared storage solution is helping Future Time Pictures continue to work during these challenging times with Work from Home orders in place.

**MEDIA VAULT IS
VERY EASY TO
USE. THE SUPPORT
TEAM AT CODEX
SET IT UP AND
SHOWED US THE
EASY-TO-USE
ADMIN USER
INTERFACE.
SYSTEM IS
USER-FRIENDLY,
CLEAR, AND
LOGICAL**

Pd Hardy

Future Time Pictures delivers innovative, cinematic behind-the-scenes (BTS) content to the world's most respected film studios, television broadcasters, and production companies on some of the most high profile projects distributed. Clients include Paramount Pictures, Universal Pictures, and Sony Pictures.

Key creative is Rob Sorrenti. Rob is an award-winning British director, writer, and producer. He is renowned for his critically-acclaimed short films and documentaries. Rob's productions, including work with Oscar-nominated and winning directors Stephen Daldry, Paul Greengrass, Christopher McQuarrie, entrepreneur Sir Richard Branson and actor Tom Cruise. His work has reached millions of people globally.

How big is the team? Do you manage all projects in-house or do you scale out-of-house with remote freelancers?

We have three full-time employees and a large roster of freelance crew that we regularly work with to deliver the most creative product.

Why is/was there a need for a shared storage system at Future Time Pictures?

As the company grew and worked on multiple edits simultaneously, it became challenging to manage multiple direct attached RAID drives; this often involved time-consuming data transfers to ensure that drives matched. We wanted a shared storage system to allow seamless sharing of files and folders on a network but could not justify the purchase of a rack-based system and infrastructure.

With multi-media deliverables, how important is it to have access to all of your content in one easy to access shared storage offering like Media Vault?

This is very important, especially during final project delivery when access to files and information is often needed very quickly. We were wasting time managing data and a shared storage system like Media Vault helps us arbitrate all of these projects and deliver projects on time.



What creative applications are you utilizing in house and on what platforms? Do you have a mixed creative platform with macOS and Windows applications being used with Media Vault?

We are macOS based and use multiple creative applications. Examples include Avid Media Composer ProTools, Adobe Creative Suite (Premiere Pro, After Effects, PhotoShop), DaVinci Resolve and many other applications that help us refine our deliverables.

What is your typical in-house workflow? How does Media Vault improve upon your previous workflow?

When RAW media is brought into the office and backed up, we create transcoded proxy files of this media that we store on Media Vault. Our Assistant Editor then logs and organises the footage in Avid.

Once the source footage is ingested, editors can work on projects using any of our workstations, as they all share access to the media on Media Vault.

The improvements are accentuated when working on multiple projects simultaneously, as our editors and creative team can easily move between workstations that host the required applications and still access relevant projects all stored on Media Vault.



How easy is Media Vault to use?

Media Vault is very easy to use. The support team at CODEX set it up and showed us the easy-to-use admin user interface. System is user-friendly, clear, and logical. We rarely need to use the admin centre, unless creating new file system volumes. Day-to-day use is the same as any other external hard drive, all simply accessed through Finder on our Mac platforms.

When relocating due to the Covid-19 lockdown, how easy was it to pick up, move, and set up Media Vault?

This was a godsend! When the lockdown came into effect, there was little time to organise. Luckily Media Vault is big in capacity but small enough to take home, and it doesn't take up too much space with its ergonomic design. I didn't need to take home boxes of hard drives, everything I needed was all in one place.



Were you able to continue using Media Vault at home exactly the same as you could in the office?

Absolutely, there has been no change. Other colleagues cannot connect to it due to remote security issues but because things have changed during Covid-19, they have had no need to.

What are your general comments/feedback/suggestions for Media Vault?

Overall it has been a very positive experience. CODEX has bent over backwards to accommodate us every step of the way. We will continue working with them as they roll out new features on Media Vault, such as advanced user group access management, remote access, cloud integration and other functions they are developing.

We are looking forward to using Media Vault on the 'Making Of' of the next two *Mission: Impossible* movies.



Take a look at their past work, including behind-the-scenes of *Mission: Impossible - Fallout*

- www.futuretimepictures.com



SHOWING A NEW SIDE TO THE INVISIBLE MAN

Behind the scenes on an ALEXA LF workflow with DP Stefan Duscio ACS and DIT Christopher Reig.



Originally published in 1897, H.G. Wells' science fiction novel *The Invisible Man* has been adapted to in film, television, comics, even stage and radio productions. One of the first film adaptations of the story was Universal's 1933 production of *The Invisible Man* – which coupled with other horror classics such as *Frankenstein*, *Dracula*, and *Bride of Frankenstein* – helped usher in a new era of horror cinema. Now, after 100 years since its original publication, Director Leigh Whannell crafts his own vision of the timeless classic where the main character, Cecilia, works hard to prove that she is being hunted by someone nobody can see.



TO RECEIVE
SUCH AN
ENTHUSIASTIC
APPROVAL FROM
POST PRODUCTION
IS A TESTAMENT
TO CODEX'S
REPUTATION OF
RELIABILITY.

Christopher Reig

CODEX had a chance to go behind the scenes on the new film with DP Stefan Duscio ACS and DIT Christopher Reig to gain a deeper understanding of the workflow utilized for this project and working with the ARRI ALEXA LF and new ALEXA Mini LF cameras.

Using the new ARRI ALEXA LF and Mini LF with Signature Primes, Reig knew that with large format sensors, despite the size of the camera, RAW capture generates a lot of data. Early on in planning the entire production workflow from set to post, Reig and the post team decided to use CODEX High Density Encoding (HDE) to reduce the size of the data by over 40% without any loss in image quality. When it comes to being invisible, RAW capture allows the production to capture the full image quality of the sensor through the high quality of the ultraclean and sharp ARRI Signature Prime lenses and encode it with HDE to achieve the same image quality but in a reduce data footprint. That means cost savings for the production while providing Duscio with the ability to maximize the image quality with the ARRI ALEXA LF camera series.

"I love the ARRI ALEXA LF large format sensor and have been trying to shoot on it as much as possible over here in Australia," says Duscio. To be honest, it doesn't change my working methods much in terms of lighting and gripping, though the end result has a lot more depth and dimension. The sensor size has hit a real sweet spot and opens up the use of so many more lenses, especially the new ARRI Signature Primes optimized for the ARRI ALEXA LF sensor."



"Chris put us onto HDE to minimize our data use," continues Duscio. "He was incredible, and we spent most evenings colouring the footage in Davinci Resolve after we wrapped."

Reig encoding with HDE enabled his team to wrap up quicker at the end of the day while still managing the large format data generated from the production teams. "As Stefan mentioned, we employed HDE for all ARRIRAW material shot on the show for the obvious reasons of reducing the data footprint," says Reig. "When Stefan and I were floating the idea of using HDE on the show, despite its pre-release status, I was a little skeptical we would get the ultimate sign-off from post production in the States. Not only did they green light our workflow, they were also feeling much better about the smaller data rates we generated versus straight ARRIRAW! To receive such an enthusiastic approval from post production is a testament to CODEX's reputation of reliability."



"Our data rate for 4.5K Open Gate HDE was around 950GB/hour, which is absolutely incredible given the 1,800GB/hour decoded original size," says Reig. "This puts large format cinematography and raw-format capture on the same playing field as Super35 ProRes captures. As a result, this allowed us to keep an entire copy of the show's digital negative on portable RAID systems – which something absolutely vital for turning around the film in the very condensed post schedule of this film."

The ARRI ALEXA Camera equipment and ARRI Signature Prime lenses and additional kit in support of the Camera Department on *The Invisible Man* was provided by Takao Hasuike and team at Cinoptix Camera & Lenses, in Chatswood, Australia. Cinoptix is a long time CODEX supporter and has worked hard to make sure productions consider capturing in ARRIRAW. CODEX High Density Encoding helps to make that vision come into focus for all production to see.



Camera Type: ARRI ALEXA LF and Mini LF
Camera Rental by: Cinoptix

Director: Leigh Whannell
Director of Photography: Stefan Duscio, ACS

DIT: Christopher Reig

HOW PIX STREAMLINES PRODUCTION

The industry-standard tool for securely sharing dailies and cuts, PIX began as an acronym for Production Information Exchange.



As the name implies, the system was conceived as a way of streamlining the flow of information across the complex webs of human talent and technology that produce media content. The virtues of dependability, security and ease of use that led to wide adoption of the PIX System for dailies are also facilitating communication in every other aspect of production from script to screen.

From concept to screen, everyone on the same page

PIX streamlines the Script process, from development through archiving.



The nexus of any production – the script – requires an astonishing amount of administrative attention. PIX can streamline this process, from development through archiving, beginning with the accurate tracking and distribution of the latest rewrites between writers, studios, producers and directors. Once a script is locked and greenlit, distribution is handled in a specific PIX project that offers tailored security precautions and ensures that current drafts are available throughout the shoot for the studio and the entire production team. After post, the final script serves as a safe, yet easily accessed reference for the future.

Casting the Net

PIX brings flexibility and organization to casting for a faster, smoother process.



Pros know that the frictionless flow of information can markedly accelerate most production processes. In the case of casting, PIX's flexible permissions scheme means that audition reviews happen faster, with security and privacy concerns eliminated. Casting materials of any description – video and audio recordings, headshots, resumes – can be uploaded, organized and shared with and commented on by casting directors, producers and directors. The Approvals tool in the PIX viewer allows for quick sorting and easy navigation and distribution of approved assets. Information – the lifeblood of production – gets where it needs to go, safely and accurately.

A Sound Workflow with PIX

PIX Sound and Music workflows make sound post seamless, from anywhere.



Sound editors, music supervisors and composers – as well as directors – depend on the PIX Sound and Music workflows to review potential cues in anticipation of cut releases and the final mix. Editorial work blend seamlessly, even using live review sessions through PIX to efficiently collaborate in spotting sessions, laying the groundwork for smooth ADR. After ADR, new edited material is easily uploaded to PIX and shared with colleagues anywhere.

Creating an Illusion

Effective communication in PIX is key to a visual effects pipeline.



Today's elaborate, high-tech effects require extensive planning, and their success often depends in large part on visual harmony with main unit imagery. PIX's strength as a communication tool aids in design, construction, review and approval. Communications sometimes handled through standard email are bolstered when the notes and comments are passed along together with the images being discussed – another small but important improvement in efficiency that leads to quality filmmaking.

Reviews and Previews

Secure, industry-standard content previews and publicity screeners using PIX.



The Motion Picture Association now officially prefers to screen ratings submissions via PIX whenever possible. Even during the current Covid-19 crisis, the MPA has continued securely reviewing submissions by adjusting workflows for individual viewings. A wide range of studios and large production companies handle MPA projects by uploading their submission cut for a specified review period. It's a great example of X2X technology keeping the production wheels turning to the benefit of the entire industry, and another reason PIX has become the standard throughout the production universe. Similarly, PIX is widely used to securely send screeners to press and publicity channels – PIX has worked with every major talk show over the years to place custom hardware in offices and homes. Some clients use PIX's tvOS application to review. During the Covid-19 crisis, PIX's industry-standard security protocols ensure that pre-release content screenings can be safely shared with large numbers of employees or vendors, obviating the need to rent a screening room.

We will be focussing more on each of the PIX production processes in the coming months so keep checking the X2X homepage and upcoming issues in mag app.

DOCTOR SLEEP REVISITS OVERLOOK HOTEL

Cinematographer Michael Fimognari depends on a CODEX Workflow.



The Shining, Stanley Kubrick's masterpiece of psychic dread, is worshipped, studied and copied by cinephiles and filmmakers everywhere. So taking on *Doctor Sleep*, which serves as a sequel to *The Shining* and uses some of the same elements, for instance the haunted Overlook Hotel makes an appearance, must have been a daunting prospect to director Mike Flanagan and director of photography Michael Fimognari.



IT'S SUCH A SEAMLESS INVISIBLE PROCESS. I DON'T EVEN THINK ABOUT IT ANYMORE IT'S JUST A THING THAT WORKS, A GIVEN, WHICH MAKES ME HAPPY

Michael Fimognari

The duo had previously worked extensively together, with credits including features *Gerald's Game* and *Oculus* and the Netflix anthology series *The Haunting of Hill House*. Rather than mimicking John Alcott's iconic, contrasty cinematography in the original, the duo created a different universe based on the script for *Doctor Sleep*, which Flanagan adapted from Stephen King's novel.

We felt responsible, and it was something we took very seriously – to honor the Stephen King and Kubrick aspects, while still telling our version of the story, says Fimognari. Like many of Mike's stories, it's about childhood trauma and how that affects people later in life. It's a story of recovery and redemption.

"The visuals of *Doctor Sleep* are optically similar to *The Shining*," he says. "But the use of color, and the way we move through space at times, is very much related to that recovery narrative. It's a different language. We used lighting more as an expressive element, partly because characters are moving through different parts of the country at different times of the year, in three parallel storylines. We felt it was important to differentiate the struggles and challenges of these characters. At times, you'll see a slightly grittier, natural lighting philosophy as opposed to the more white light that *The Shining* employed."



In 1980, Alcott shot *The Shining* with spherical lenses and slow-speed, fine-grain 100 ASA film stock. Fimognari shot *Doctor Sleep* with the large-format ARRI ALEXA 65 and ARRI Prime DNA lenses. The CODEX workflow included capture of uncompressed 6.5K ARRIRAW images processed with the industry standard CODEX Vault XL, running CODEX Production Suite to convert the sensor RAW data into processed ARRIRAW files.

"*Gerald's Game* was the first opportunity we had to use the ARRI ALEXA 65, and we fell in love with it," says Fimognari. "We also love the optics that are available for it. The ARRI A65 was particularly appropriate for *Gerald's Game* because it was a more confined space. We could get shallow depth of field and focal separation even when the character is sitting against a wall. You can have that optical elegance even in small spaces."

"Also, we had a scene in that film in which an eclipse causes color to gradually change over the course of two minutes, he says. We love the ability of the sensor and the workflow to give us very discreet and specific color control. All the ARRI sensors are pretty spectacular, but the 65 in particular we thought was fantastic."



Fimognari and Flanagan also used the A65 and Prime 65 glass on all ten episodes of *The Haunting of Hill House*, which King called close to a work of genius. So when it came to *Doctor Sleep*, it was a no-brainer, says Fimognari. "It was going to be experienced on a big screen, and we wanted spherical lenses and a 1.85 aspect ratio in order to stay in the world of Kubrick. Our film covers a lot of ground, but it's also very intimate with some small spaces, and we wanted a look where we could control depth. The ALEXA 65 was perfect. It all felt right. We saw it come to life in IMAX and it looked great."

The filmmakers tended toward wider-angle lenses, set closer to the actors, which is consistent with their previous work in films like *Oculus*. On *Doctor Sleep*, especially in the scenes at the Overlook, they echoed *The Shining* by composing graphic, symmetrical frames with a vanishing point perspective, and by lighting with a dimmed, slightly sickly warmth.



Regarding the CODEX workflow, which is based on the Vault XL Labs from ARRI Rental, Fimognari says, "It's such a seamless, invisible process. I don't even think about it anymore – it's just a thing that works, a given, which makes me happy! We strive to have the most efficient day possible. Mike and I are very specific about what we want to accomplish in a day, because that gives us the time to make the special shots that elevate the material. In order to do that, our workflow has to work. And it absolutely does that – which is so cool. It's a good feeling going home saying, OK, we got the scene. We don't have to wonder."

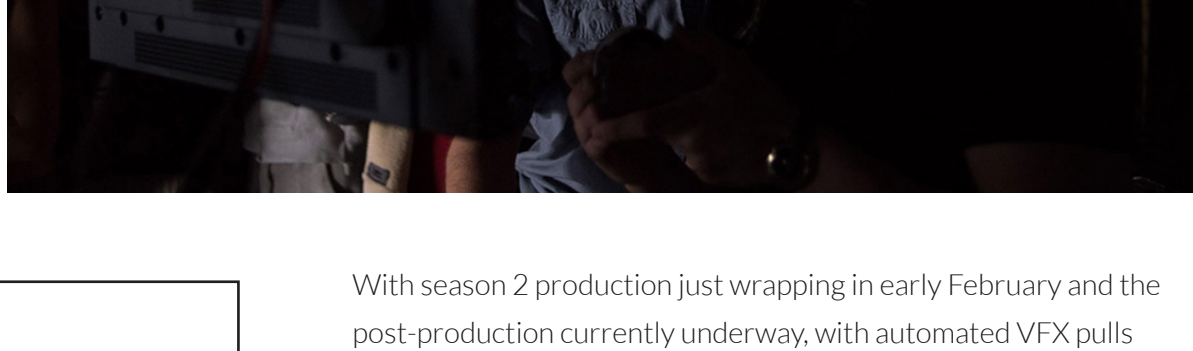
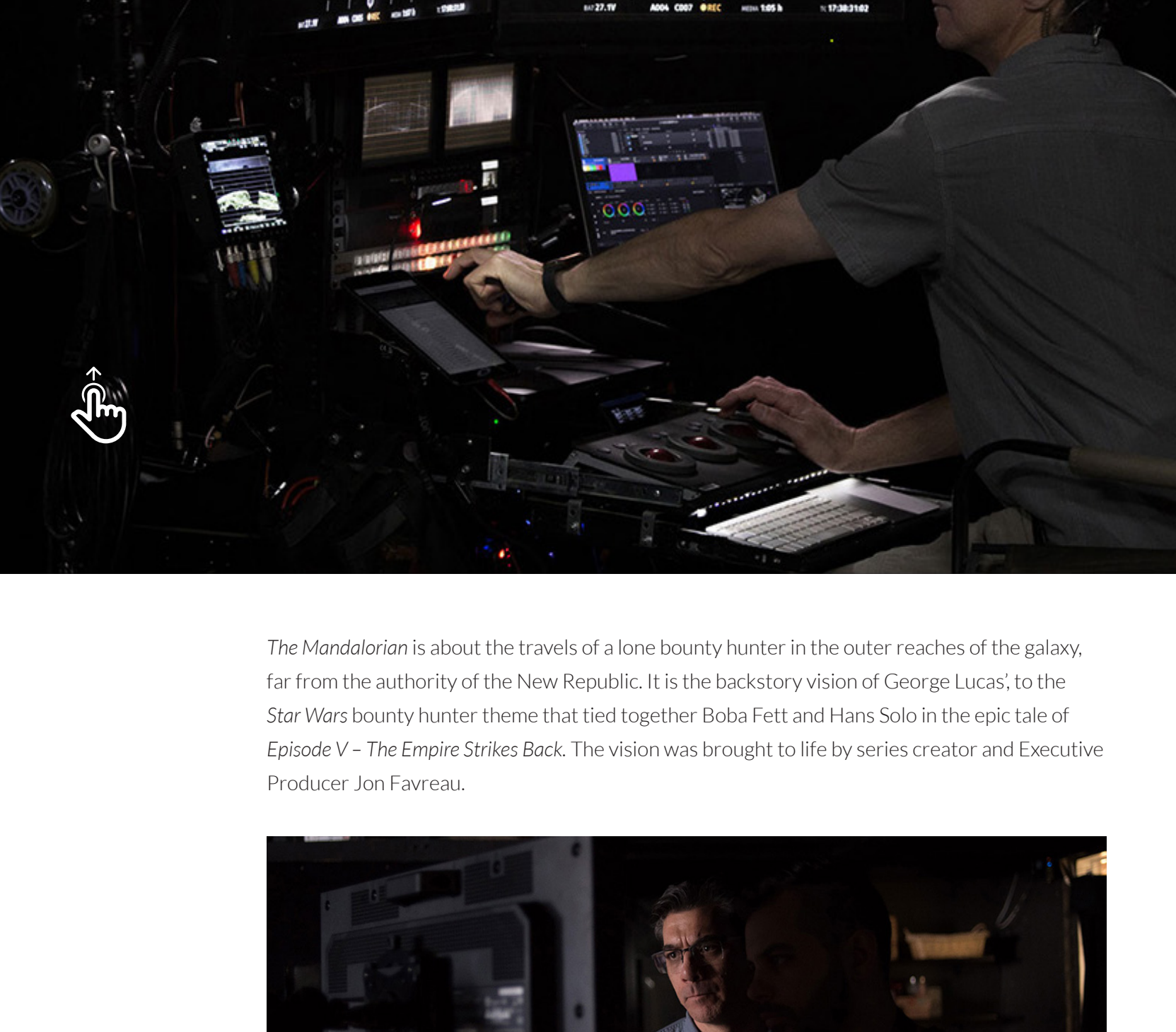
Doctor Sleep hit screens in late 2019, reportedly earning more than \$70 million against a budget of around \$45 million. Since then, Fimognari has tried his hand at directing, on two sequels to *To All the Boys I've Loved Before*. Those Netflix teen rom-coms are scheduled for release in 2020. And currently, Fimognari is prepping to shoot a new feature with Flanagan.



Director: Mike Flanagan
DP: Michael Fimognari
DIT: Dane Brehm
Camera Rental: ARRI Rental
VFX supervisor: Scott E. Anderson
Digital Intermediate: Jill Bogdanowicz – Company 3
Camera: ARRI ALEXA 65
Lenses: ARRI Prime DNA
Format: ARRIRAW
Resolution: 6560 x 3100

DIT EDUARDO EGUIA ON MAKING THE MANDALORIAN

DIT Eduardo Eguia details the imaging process used on *The Mandalorian*.



The Mandalorian is about the travels of a lone bounty hunter in the outer reaches of the galaxy, far from the authority of the New Republic. It is the backstory vision of George Lucas', to the *Star Wars* bounty hunter theme that tied together Boba Fett and Hans Solo in the epic tale of *Episode V – The Empire Strikes Back*. The vision was brought to life by series creator and Executive Producer Jon Favreau.

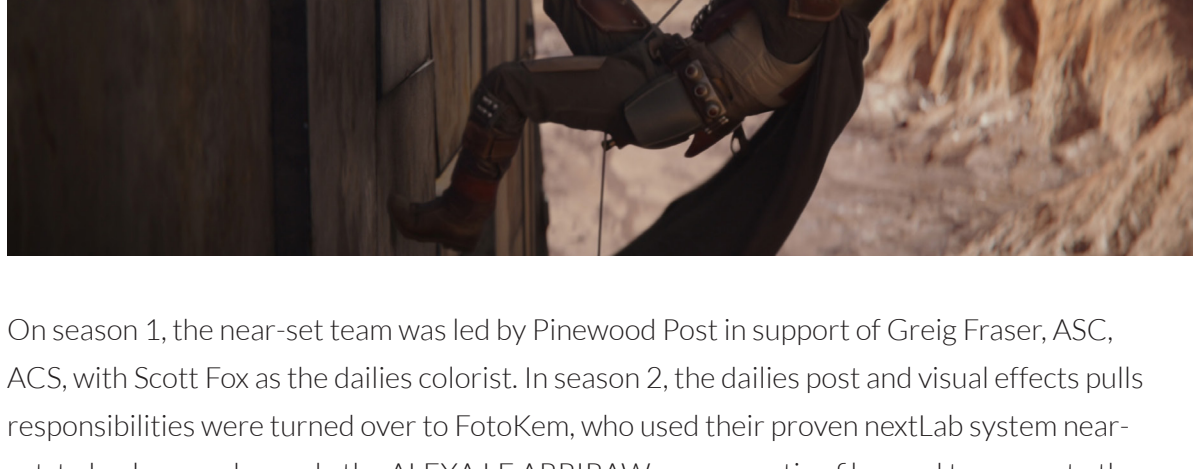
WE KNEW THAT UTILIZING HDE WOULD BE A VERY IMPORTANT WORKFLOW IMPROVEMENT FOR PRODUCTION AND POST-PRODUCTION. IT PROVED TO BE THE RIGHT DECISION

Eduardo Eguia

With season 2 production just wrapping in early February and the post-production currently underway, with automated VFX pulls being delivered by FotoKem, and the final finishing being done at Company 3, Disney+ hopes to continue the momentum of this premier franchise that helped launch their streaming service last year.

CODEX caught up with Digital Imaging Technician, Eduardo Eguia, who has been in the role of DIT since season 1, working alongside Directors of Photography, Greig Fraser, ASC, ACS, Baz Idoine, and joining on season 2, Matthew Jensen, ASC.

As showrunner, Jon Favreau is not only continuing to tell the stories of adventures in galaxies far, far away, but he is also continuing to push the boundaries of how a production visualizes the final concept while still on set. Extended the pioneering work done in VR on *The Jungle Book* and *The Lion King*, Favreau and ILM Visual Effects Supervisor, Richard Bluff, used the Unreal game engine technology to create incredible virtual set extensions.



Production for season 1 and 2 was primarily based at MBS Studios in Manhattan Beach, California, on multiple stages, with some external shots captured on location using a built-up backlot. With ample stage room at MBS Studios, the post-production teams were set-up near set in order to quickly generate the dailies for both picture and visual effects editorial.

On season 1, the near-set team was led by Pinewood Post in support of Greig Fraser, ASC, ACS, with Scott Fox as the dailies colorist. In season 2, the dailies post and visual effects pulls responsibilities were turned over to FotoKem, who used their proven nextLab system near-set, to back-up and encode the ALEXA LF ARRIRAW camera native files, and to generate the editorial deliverables. FotoKem also engineered and set-up a system to automate the visual effects pulls from the encoded ARRIRAW files and generate the OpenEXR plates for ILM and the other visual effects vendors.

In speaking with Eduardo about the data migration process and color pipeline, CODEX wanted to learn about his DIT cart set-up, and the configuration of software tools used to manage the two seasons efficiently. "My DIT cart can process up to 6 cameras simultaneously, applying custom real-time color grading to each individual camera. I used Pomfort's Livegrade Pro with an ACES workflow to achieve this process. From my cart I sent a color corrected REC709 signal to the DP's monitors, and to the Video Assist to distribute the color corrected signal to the rest of set. In terms of looks, our starting point was a look up table (LUT), created by Greig, based on a film stock. From there we did some adjustments to achieve his vision for the show, and we generated a base LUT. Whenever we needed to make changes, I created individual color decision on top of this LUT, or CDLs, to achieve the desired look. These CDLs were sent to Scott Fox, the dailies colorist, to apply and balance the grades. The same process has continued with Baz and Matthew on season 2, except FotoKem applied the CDLs, and we use a show LUT from Company 3, who are providing the finishing services for season 2."

In setting up the workflow for season 2, FotoKem employed CODEX's High Density Encoding (HDE) process. HDE provides a bit exact, lossless copy of the original ARRIRAW native files but at 50-60% of the original size. This allowed dailies colorist, Jon Locke at FotoKem to store more of the ARRIRAW files near-set, and to deliver quicker turn overs using their automated visual effects pull system. "FotoKem could deliver the turn-overs quicker with the nextLab system, since the files were effectively smaller by 2:1 in data footprint". The HDE files were then supported through the entire post-production pipeline including final color with Charles Bunnag, a finishing colorist at Company 3.

"I have to say that seeing the difference in media processing between seasons 1 and 2, when HDE became widely available was fantastic," says Eduardo. "HDE helped the workflow tremendously, not only to speed up the process of managing the media but by improving the turnaround time to get the CODEX capture drives back to the Camera department for reuse."

This reduced the storage required to backup up the media that was shot the previous day. "Before season 2 started, we discussed the value of deploying HDE with James Blevins, the post-production supervisor. We knew that utilizing HDE would be a very important workflow improvement for production and post-production. It proved to be the right decision."

The visual effects supervisor for the production was Richard Bluff. The Visual Effects design was commandeered by Industrial Light and Magic (ILM), the academy award-winning visual effects company founded by George Lucas. The VFX were guided across the series by the supervision team of VFX Supervisors; James Porter, Hayden Jones, John Knoll, Alex Prichard, Steve Moncur, and Jose Burgos.

Richard Bluff also worked with various other visual effects houses to deliver on the enormous number of VFX shots in the production, such as Base FX, Image Engine, Important Looking Pirates, Ghost VFX, Hybride, MPC and Pixomondo.

The production made use of new virtual set extension technology pioneered by ILM. The idea of rear screen compositing has been in use in filmmaking since the silent era and has been deployed in numerous ways for window replacements of background in cars and train scenes quite routinely.

What wasn't routine for *The Mandalorian* was the sheer scale of the virtual set, formally called Stagecraft. The green screen volume created for the show was 20 feet tall, 270 degrees around, and 75 feet across — the largest and most sophisticated virtual filmmaking environment yet made and used in production.

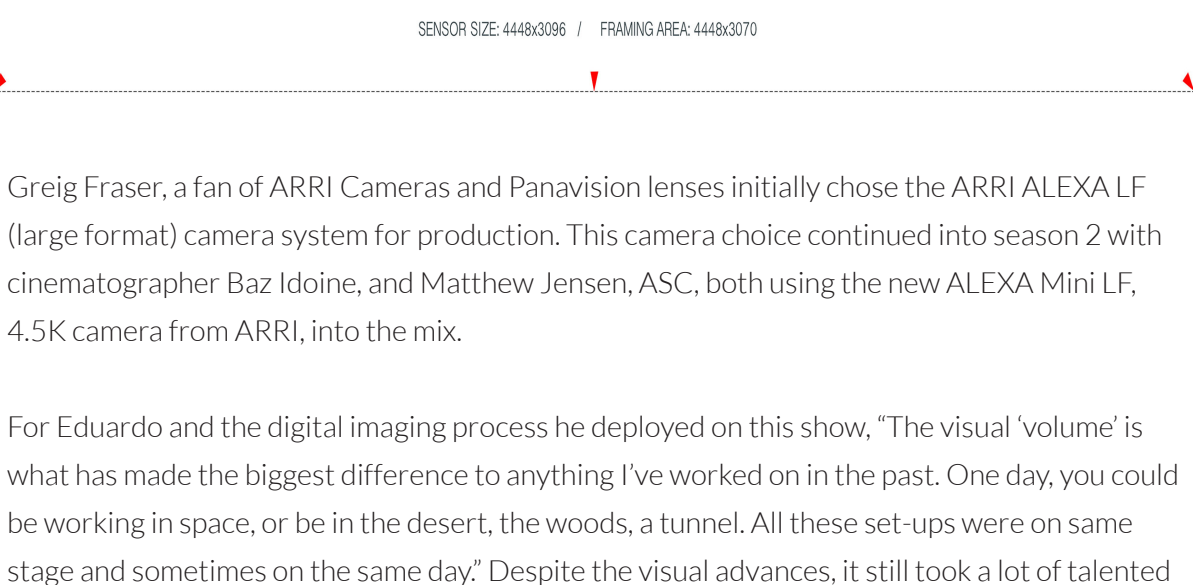
The Stagecraft background is a set of enormous LEDs. The innovation driving the production use of Stagecraft, and other like designs, is the advancement in smaller pitch on the LED panels between the actual LED elements. (see accompanying article). This allows the images projected by the LED walls to look more photo-realistic because they are not static. Not only is the image shown on the LED walls played back in real-time by powerful GPUs, but that 3D scene is directly affected by the movements and settings of the camera. If the camera moves to the right, the image alters just as if it were a real scene.

This is where the Epic Unreal game engine came into play using an array of powerful PC/GPU that were set-up and controlled by a team of technicians, commonly referred to on set as "The Brain Bar".

"The virtual backgrounds were astonishing, and a game changer on set for our industry. There was an initial learning curve to it, but the results speak for themselves and look amazing," adds Eduardo.

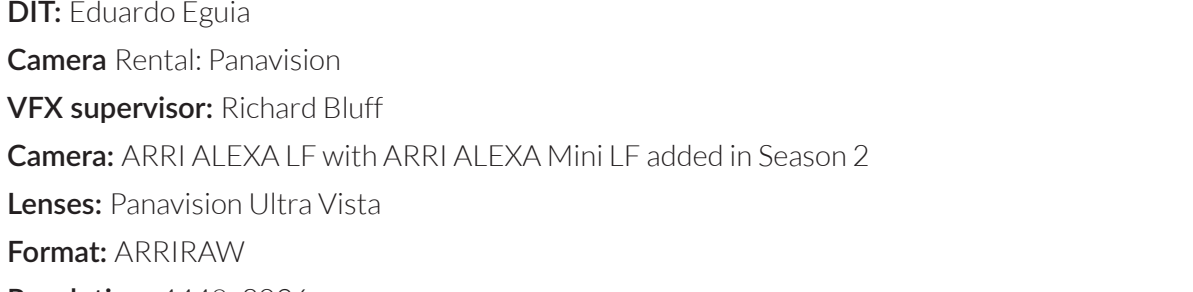
"The Brain Bar team was in constant communication with the DP's, providing for a perfect integration of the virtual scenes with foreground real elements. It was also important for the ongoing coordination between the DP, the Brain Bar, the Gaffer and me, not only to achieve the best results, but for the steady blending of the looks, as any color adjustments by anybody on either side affected the image."

Eduardo had a professional 4K OLED Monitor setup directly next to the DP monitors, so they could watch in high resolution the signal coming out of the cameras while able to apply a matching color grade to the individual cameras. This allowed the team to see with total detail the live blend of the real foreground with the virtual background.



Greig Fraser, a fan of ARRI Cameras and Panavision lenses initially chose the ARRI ALEXA LF (large format) camera system for production. This camera choice continued into season 2 with cinematographer Baz Idoine, and Matthew Jensen, ASC, both using the new ALEXA Mini LF, 4.5K camera from ARRI, into the mix.

For Eduardo and the digital imaging process he deployed on this show, "The visual 'volume' is what has made the biggest difference to anything I've worked on in the past. One day, you could be working in space, or be in the desert, the woods, a tunnel. All these set-ups were on same stage and sometimes on the same day." Despite the visual advances, it still took a lot of talented people to make it look real, from the incredible art department visuals, to the skilled animators who brought the characters to life, and to the special effects teams, and the Brain Bar team. We learned a lot on season 1, but Grieg and Baz really understood the technology and embraced it from the very beginning, and they pushed the technology to its limits to achieve some amazing results. On season 2, 'The Volume' was bigger, and the results were even more impressive. I can't wait to see where the future takes us!"



Director(s): Dave Filoni, Rick Famuyiwa, Deborah Chow, Bryce Dallas Howard and Taika Waititi
DP(s): Greig Fraser, ASC, ACS (Season 1) and Baz Idoine (Season 1 & 2) with Matthew Jensen, ASC (Season 2)
DIT: Eduardo Eguia
Camera Rental: Panavision
VFX supervisor: Richard Bluff
Camera: ARRI ALEXA LF with ARRI ALEXA Mini LF added in Season 2
Lenses: Panavision Ultra Vista
Format: ARRIRAW
Resolution: 4448x3096



JAMES WHITAKER LIGHTS THE WAY TO THE STARS

Making *Troop Zero*.



***Troop Zero* is a 2019 American comedy-drama film, directed by Bert & Bertie, from a screenplay written by the academy award winning *Beasts of the Southern Wild* co-writer Lucy Alibar, and inspired by Alibar's 2010 play *Christmas and Jubilee Behold the Meteor Shower*.** The film delivers on some great performances by an incredible cast led by Viola Davis, Allison Janney, Jim Gaffigan, Mike Epps, Charlie Shotwell, and featuring Mckenna Grace, who plays a nerdy young girl who talks to the stars at night in an effort to communicate with her deceased mother. Her mother nurtured the young girl into believing that meteors and shooting stars were messages from the heavens above. NASA comes along and announces the Golden Record program, where they will record the voices of people all around the world, to playback in space on the soon to be launched Voyager probe. The winner of a local talent show will have their voices recorded. This is the girls one real chance to make sure her voice is heard and that she can really communicate with her Mom in space. She must infiltrate the high-and-mighty Birdie Scout youth group in order to enter the talent show and get the chance to win and to have her voice heard throughout the stars. The film had its world premiere at the Sundance Film Festival back in February of 2019 and was released this past January by Amazon Studios and is streaming on Prime Video.



CODEX IS JUST SO FAST AND ROBUST THAT I NEVER GET A PUSHBACK IN SHOOTING RAW ON A PRODUCTION

James Whitaker, ASC

Forced to stay at home and not able to work during the recent production shutdown due to the COVID-19 pandemic, CODEX was able to catch up with James Whitaker, ASC, who was the cinematographer on *Troop Zero*. *Troop Zero* is a small budget feature that was captured over 28 days, across multiple locations that went off in almost every direction outside of New Orleans, in settings made to look and feel like the sweltering summer experience common in rural Georgia during the mid-seventies.

Troop Zero was also the first feature length production by the award-winning directing team Bert & Bertie (*The Taxidermist*, *Worm*, *Phobias*). Based on his impressive IMDb listing of cinematography credits on feature length projects (*The Cooler*, *Captain America: Civil War*, *Thank you for Smoking*, and *Patriot*), Whitaker was chosen to light and capture the story. Knowing they had limited budget and time, Whitaker meticulously scouted out the locations ahead of time, blocking scenes and planning the lens choices to best address the style and action the directors wanted to convey during the shoot.

Working closely with a camera team consisting of veterans, 1st AC, Bryan DeLorenzo and key grip, Charles Lenz and gaffer, Allen Parks, they were able to light the way and set the mood for the production.



"Using a Look Up Table (LUT) that had been gifted to me by Sean Coleman at CO3 as a starting point, I worked closely with the digital imaging technician (DIT), Adrian Jebef to shape this into our show LUT. Adrian then applied the LUT across a 24" calibrated monitor and then routed this signal to the Director's monitors, including to the video-village and the video assist. The signal was sent to the entire set so that the established look was presented to everyone from the HMU to Costume and Wardrobe, to make sure there were no questions on what the picture would look like. With limited time and multiple locations, Adrian would adjust the looks from scene to scene with CDL's or Printer Light adjustments, and these looks were given to the dailies colorist Alex Garcia, from Light Iron, working near-set on location. Alex would balance these looks across the multiple cameras and keep things consistent. These looks were then delivered to editorial and posted to PIX for review."

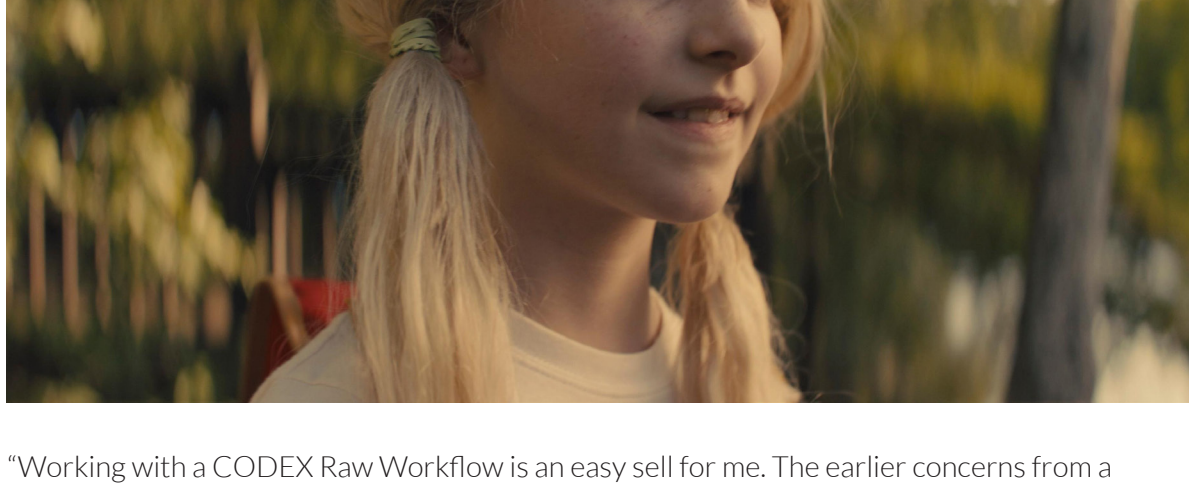


Per Whitaker, "It was great working with Bert & Bertie on this production. Bert could be directing the talent while Bertie would be able to discuss the camera moves with me for the next set-up. Then the next day they would switch roles and it would be a seamless transition." "The Bert's were really into the idea of formal framing, but they also wanted to mix it up. We looked at a bunch of different films as references and didn't really find what we liked, so we created a visual language of our own. I used the Vantage MiniHawk lenses. They have an anamorphic look and come with all the good things I wanted; they are fast, and they are light. They actually have two apertures that allow you to have anamorphic-like distortion in the bokeh but they are actually spherical lenses. This allowed me to use a short focal length lens for a wide shot and have the actors run into close up. The close focus is basically the front element of the lens which is amazing."



There's a particularly great food fight scene, between the members of the titular *Troop Zero* and the rival group of Birdie Scouts, where the use of slow motion perfectly captures how a group of precocious misfits would envision the experience. It's like an epic battle in the World War of Girl Scouts, with flour raining down around everyone, as someone runs by wielding a soaked eggbeater, spraying everyone in-range with rapid fire batter bullets, while another scout takes a bowl of rainbow sprinkles to the face. The slow-motion intensity was captured at high frame rate with the ARRI ALEXA SXT camera system using the CODEX SXR capture media. Using a combination of dolly and hand-held shots that move the viewer through the action, the motion feels smooth and the images are in focus throughout.

"When I first sat down with the Bert's and Corrine at Light Iron to grade *Troop Zero*, we had so much range in the image. This is why ARRI cameras are my first choice. You have this large 3.4K filmic image in RAW that we could push wherever we wanted. We started warming it up, making it less saturated and windowing various parts of the skies and faces. After a bit of this we sat back and said this doesn't feel like it is servicing the story we wanted to tell. Sometimes you need to simply go back to basics." "We started from the beginning using the same LUT that we had on set, and then Corinne did a basic Printer Light grade to start and it looked pretty much like what we had viewed on the monitors during the shoot. We skewed a bit from the original CDL values, but the overall feel of the look was very close in the end."



"Working with a CODEX Raw Workflow is an easy sell for me. The earlier concerns from a Producer about the cost of the capture drives, and the time it takes a DIT to back up the data have seemingly gone away. CODEX is just so fast and robust that I never get a pushback in shooting RAW on a production. The last two TV shows I shot, Season 2 of *Patriot and Perpetual Grace*, LTD. were both captured on CODEX in ARRIRAW. I just bought an ARRI ALEXA MINI LF with the new Compact Drives and I am looking forward to using this when we get back to work."



Director(s): Bert & Bertie
DP: James Whitaker, ASC
DIT: Adrian Jebef
Camera Rental: Keslow Camera
Cranes/dolly supplied by: Chapman Leonard Studios
Digital Intermediate: Light Iron Digital
Camera: ARRI ALEXA SXT
Lenses: Vantage MiniHawk
Format: ARRIRAW
Resolution: 3424 x 2202
Distributor: Amazon Studios and Prime Video (theatrical and streaming)

PIX

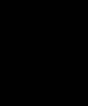
cinematic whichever way you view it



Smartphone | Tablet | Desktop | Large Screen

MOVING IMAGES UNDER THE STARS

Showcasing DIT Adrian Jebef, and his work on Amazon Studios' *Troop Zero*.



Troop Zero is an inspiring movie about a group of elementary-school misfits who band together to form their own troop of Birdie Scouts in the little rural town of Wiggly, Georgia in the summer of 1977. The Birdie Scout troop is hobbled together by an energetic but shy girl name Christmas Flint. This ragtag troop infiltrate the Birdie Scout youth group in order to win a talent show. The winning Birdies will earn the right to have their voices included on the Voyager Golden record that will sail into the cosmos, which Christmas believes will be heard by life in outer space, a connection her deceased mother nurtured when they looked up into the stars.



**WE NEVER DEALT
WITH ANY CLIP,
FILE, OR CARD
CORRUPTION, EVEN
THOUGH WE WERE
SHOOTING IN
THE SWAMPS
OF LOUISIANA IN
THE MIDDLE OF
SUMMER**

Adrian Jebef, DIT

The film had its world premiere at the Sundance Film Festival back in February of 2019 and was released this past January by Amazon Studios and is streaming on Prime Video. CODEX had the excellent opportunity to talk to James Whitaker, ASC, who lensed the show for the directorial team debut of Bert & Bertie that they adapted from the screenplay written by the academy award winning *Beasts of the Southern Wild* co-writer Lucy Alibar, and inspired by Alibar's 2010 play *Christmas and Jubilee Behold the Meteor Shower*.

During the course of our discussion with cinematographer James Whitaker, he encouraged us to speak to the other people involved, namely Adrian Jebef, DIT, who worked directly with the CODEX workflow and coordinated directly with the dailies operator at Light Iron Digital, to make sure that the intent from set was properly carried across into post-production for the dailies review for Bert and Bertie.

James Whitaker told us he had never worked with Adrian before, but he came highly recommended from one of his peers, cinematographer Jo Willems, ASC, SBC. Like Whitaker, Jebef came to the show with a high pedigree of experience in on set color and data management. Jebef is known for his DIT work on tent pole films such as the entire *Hunger Games* series, lensed by Jo Willems. He was the 2nd unit DIT on *Godzilla vs. Kong*, as well as DIT on reshoots for Warner Bros. and Legendary Films, *Dune*, currently in post-production. Whitaker and Jebef became fast friends and a trust was formed during the camera tests and it maintained throughout the production. Small productions appear on paper like they should be an easier gig than the drama of a large budget tent-pole project, however, it's always the opposite. *Troop Zero* presented its own challenges. A cast predominantly made up of children. A very short schedule. Horrendous weather conditions. A directorial debut not for one director...but two. What could go wrong?



Our workflow on *Troop Zero* was the industry standard. We used a show Look Up Table (LUT) that Jimi had been gifted by Sean Coleman at CO3. We fine-tuned this LUT with full color decisions or CDL adjustments that I applied on a per scene basis with minor adjustments if needed per shot. Jimi had come into the picture with a strong visual plan of his intent. This freed me up and allow me to keep consistency between shots, instead of having to over-adjust and over-correct all time, while we determined a look. Jimi knew what he wanted and that made it so much easier with such a tight schedule. Light Iron handled all of the dailies and the deliverables on the show. The dailies colorist, Alex Garcia was my liaison for making sure dailies looked like what Jimi and I had created on set. Alex would balance these looks across the multiple cameras and keep things consistent. These looks were then baked into the editorial deliverables and posted to PIX for review.

We fought a lot of variables in lighting from the different moving camera angles to shooting day exteriors and at also night. Alex was fantastic at smoothing out our CDLs from set, and this really helped us to move quickly, knowing he could match the shots. The ease of shooting with an ALEXA Mini camera and the ARRI Alexa SXT using the CODEX capture drives was really straight forward. We recorded on the Codex capture drives in ARRIRAW format at 3.4K in Open Gate. Jimi used the new Vantage Mini Hawk lenses, and this provided full coverage as we framed for 2.39:1. Using CODEX capture drives allowed me to move fast even on a less-than-blockbuster budget. We never dealt with any clip, file, or card corruption, even though we were shooting in the swamps of Louisiana in the middle of summer. Watching the film now I only remember the good times and am proud of our fantastic crew's effort.



James Whitaker, ASC, on the set of *Troop Zero*

This was the first Amazon Prime Video released direct to streaming. The picture speaks for itself, but OMG, it was a really, really difficult shoot under the weather circumstances. We dealt with higher than normal temperatures, high humidity levels, constant thunderstorms, lightning, rain, bugs, poison ivy, and even a 10 ft. Alligator that took a swing at our location crew.



Amazon Original
TROOP ZERO

Through it all the ARRI camera gear with CODEX inside worked. One of the best pluses of shooting with CODEX capture drives are that they are unquestionably reliable and extremely fast. All of our material was shuttled from set to near set for Light Iron to create editorial deliverables and archive the capture drives. Every break I took the Codex capture drives to my cart and before I sent them off, I would download everything directly to a high-speed multi-bay SSD RAID stored on my DIT cart. This RAID is ridiculously fast, and the CODEX Capture Drives can keep up. Not having to wait hours for capture cards and readers to download the data, at the end of a long hot day, not only kept my sanity intact but it also kept our production on-time and on-budget. If I had to do it all over again, I wouldn't change a thing. Well maybe I might suggest shooting in the late fall when the weather calms down a bit!



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