

4k Now or Later?

4K NOW OR LATER?

By: planetMitch

And many others of course

Dedication

my thanks go out to everyone who reads planet5D!

Without you, planet5D wouldn't be very popular and I'd be doing something so completely different (and wouldn't be as happy!).

Thank you!

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About planetMitch



Over the last 5 years, planetMitch has become a leading authority in the world of DSLR video and photography.

In 2008, he founded planet5D.com - which quickly became a leader in the DSLR Filmmaking niche. He has written over 3,000 articles and blog posts covering various advancements and news regarding the latest cameras, software, filming breakthroughs.

planet5D has become the ultimate resource for insider industry information, educating hundreds of thousands every month, and Mitch is the chief 'astronomer' of this wealth of valuable information.

He co-produced the first Canon EOS 5D Mark III short on the planet called "[Incident On Marmont Avenue](#)" (click the link to see the short!).

planetMitch sources his information straight from the top industry professionals, and has interviewed over 50 of the most successful names in DSLR production, including Vincent Laforet, Shane Hurlbut, Rodney Charters, Gale Tattersall, Lisa Bettany, Barry Andersson, Richard Harrington, and Catherine Hall.

planetMitch has perfected his ability to share the lessons he absorbs from the experts with filmmakers around the universe, as he facilitates forums, writes articles,

and has been featured on roughly 100 podcasts over the last few years.

A lover of photography since his early days, he graduated to selling stock photos to make a little bit of spare cash. It wasn't much, but it allowed him to upgrade to better cameras as well as computers, and it wasn't taking money away from feeding his family.

He loves the stories that the still image can tell. In the summer of 2008, he read a story written by Arnold Kim called "[I Quit My Job](#)" — Arn is the owner of macrumors.com. He started macrumors in 2000 as a hobby, and by 2008 he was making more money with the site than he was on his day job, so he quit. The surprise to the story is that he was a doctor making more than six figures! Right then and there, planetMitch dreamed about doing the same thing.

September 2008 rolled around, and Canon announced this new version of the incredible 5D — the Canon EOS 5D Mark II. It was the first Canon DSLR to shoot full HD video and the earth moved! (It really was a huge deal in the photography world.) planetMitch knew if there was ever a chance to ride a wave of something he was really passionate about, this was it — and the blog at planet5D.com was born and thru planetMitch's enthusiasm and passion, planet5D flourished.

planet5D is now one of the most popular DSLR video blogs on the planet, and he is making a full-time living from blogging.

He couldn't be happier!

About planet5D

planet5D is in its 5th year!

planet5D started at the same time the Canon EOS 5D Mark II was announced and has, in many ways, been the leader in information and news reporting on the HDSLR revolution.

planet5D planets:

There are several sections of planet5D...

[planet5D blog](#) – our blog of HDSLR news and what is going on behind the scenes

[planet5D Headline news](#) – shows the top HDSLR blogs and their 5 most recent posts – stop in daily for one stop [Photo/Video news!](#)

[planet5D Cinema](#) – a place where we feature HDSLR movies

[superstore@planet5D](#) – ebooks, plugins, and more!

Of course, you can always [contact me](#) if you have a question, a hot news item, or just want to say hi! I really enjoy meeting new people and hearing about what makes their lives fun... even if it is just 'virtually.'



planetMitch Intro

4K? Or not 4K? That is the question

Buzzwords are very common in many industries and currently in filmmaking and video, 4K (or shooting video at a 4000 wide pixel screen resolution) is a very common buzzword as well as a huge question for film makers... should I be shooting in 4K?

Of course, there is no one answer for any one individual or any particular project-It all depends!

I could just write an ebook based on my own opinions, but that wouldn't really be fair because many people have different opinions on what's going on now and what is going to happen in the future.

So here at planet5D, we decided to investigate what the current common practices are in the industry. We sent out an e-mail to thousands of industry leaders, as well as the "common folk" to find out what they are currently doing. We have compiled those responses into this free e-book which we are giving away to our readers.

We've added their responses based on the order they came in - so there's no bias based on who they are or what they wrote. You'll find people who have embraced 4k and you'll find some who haven't and of course, there are several who are still on the fence (as you may be).

We hope you enjoy this e-book and we also hope you enjoy reading planet5D on a regular basis!

Note: while we are giving this e-book away for free, we reserve the rights to all of the contents and we have promised the collaborating authors that this content will not be shared. So please do not take any of it without written permission from me. It is only for your personal use.

CHAPTER ONE

Opinions on 4k:

The posts

Before we get into the contributions from the authors, I wanted to orient you...

To make it understandable in context, I've asked all the authors to submit a brief bio - so I decided to place that first before their contribution... otherwise, their opinions on 4k may or may not make sense.

So, you'll see:

Author's name

Bio:

Some text in italics so it is distinguishable from the contribution

Contribution:

The meat!

Steve MacDonald

Bio:

residing in the San Francisco Bay Area

My career spans 30 years in the Video Industry

Corporate shoots, Field ENG, Stringer work for ESPN, Freelance Shooter/Editor

Contribution:

The 4k evolution, deal me in...

The first time I heard the term "4k" I had no idea what it was, and I really didn't care much either.

It wasn't until I saw the first images coming from a prototype Panasonic GH4 that I could hardly believe what I was seeing.

In the last decade, I've only been astounded 3 times by images I've seen coming off various cameras. The first was the Sony EX1, the second was the Canon 5D MarkII, and the third was the Panasonic GH4 - 4k image.

Having worked with many ENG Sony Digital Beta cameras, then making a jump into HD-DV cams, namely the Sony PD150, to the stunning imagery of the Sony EX1, to the camera that changed the video acquisition world as we knew it, the Canon 5D MarkII, to the 4k world of the Panasonic GH4, it has been one jaw dropping experience after another.

Who hasn't seen Bryan Harvey's "Light of the Yucatan" shot with a prototype GH4, that wasn't astounded? And, this was a video being played off Youtube. Nothing I'd ever seen on Youtube looked quite like this, in terms of the resolution being depicted. A mirrorless camera that would be priced at \$1600 dollars, producing that image, deal me in.

The Panasonic GH4 - 4k capabilities are quite impressive when you consider it is recording the compressed 4k image internally to inexpensive SD cards.

The 4k workflow is relatively simple, and even if you have an aging iMAC, like myself, working with proxy media isn't the end of the world, however, 4k media can get daunting quickly, so the more horsepower you can muster, the better.

What about 4k delivery you ask? Good question. In a recent webinar featuring Michael Cioni, CEO of Light Iron, he stated, and I couldn't agree more, that 4k delivery will come much faster to the internet, than it will to broadcast television. I think it's much too early to even guess what delivery mechanism will be offered for 4k.

4k offers many benefits over 1080, namely resolution, and of course the ability to reframe in a 4k to 2k timeline.

Currently, none of my clients are requesting a 4k project, however I have no doubt that will change in the near future. Even if it's not being seen on a true 4k playback device, seeing it over Youtube's 2160 - 4k option on my 27" iMAC is nothing short of stunning.

The workflow for getting your masterpiece uploaded to Youtube's 2160 - 4k option is pretty much straight forward. Master file, compression, upload, there is no voodoo here. Youtube may not be viewed upon as the most professional playback platform, but at the moment, nothing else on the internet, that I know of, comes close to it's playback resolution in 2160 - 4k.

The debate whether 4k is a cinematic image, and the dynamic range numbers game will rage on and on. In my own personal opinion, I don't put 4k in a cinematic category. 4k is a resolution animal and a breed, if you will, all of it's own. I do however feel with the right lighting, and the right filtration, it can definitely look cinematic, but you're going to have to work a lot harder to achieve that look.

Any way you look at it, these are exciting times. I don't think there is a doubt 4k is here to stay, and I for one will embrace it, and I think you should too.

Steve MacDonald
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Aron J Anderson

Bio:

*DP*Director*Filmmaker*

For the past six years Aron J Anderson has been filming commercials, creating motion graphics, and other camera work for many different projects. One of those projects was a documentary called Los 17 which won a 2012 Suncoast Emmy award. Aron also started a YouTube series called TFX to where he shows how to build DIY equipment and tutorials on post production program like After Effects, Mocha and more.

He has also done production work in Puerto Rico for local TV, Intel corporate videos and the big Univision broadcast network. He also worked as director and DP on an international Saturday morning TV show called Teen Pet Vet.

What makes Aron J Anderson unique is his ability to do all aspects of a film production including: Directing, camera, set design, prop building, lighting, colorist, special effects, computer graphic, animation, sound design, lighting, editing and much more.

Occasionally he holds Production workshops geared toward cost effective ways in making a film have big production value on a small budget using DSLR cameras and the tools and techniques to make the film shine. Aron J Anderson continues to increase his knowledge in film making.

Contribution:

I have been filming on DSLR cameras for about six or so years now and love the fact that affordable cameras like the Panasonic GH4 that I own can film 4k internally. However how many of us have a 4K TV to enjoy the 4K quality. Not to many. So what we have been doing is taking that 4K resolution and downsizing it to 1080. This will actually increase the quality of the image but more importantly is the fact that 4K is still in my opinion about 5 to 8 years from being widely used in TV broadcast, internet, theaters and the public owning 4K TV and computer monitors.

I have been told that 90 percent or so of Movie theaters in the United States project their movies in 2K. So even when those Hollywood movie are shot in 4K, 6K

and higher they are projected at 2K. Some cameras like the Sony A7s has been projected on the big theater screen and because of the high bit rate and great resolution its 1920x1080 still looks amazing. So I don't think the world is ready for 4k but its great to use it as a creative way to zoom around in a 1080 time line.

Since the Panasonic GH2 came out even without the hack I was shocked how much more information it resolved then the Canon line of DSLR. Now years later the GH4 and the A7s is out and Canon is still in my opinion way behind in making cameras that can compete with a price tag under \$5,000. Canon really needs to step it up if they don't want to go into history of being known as King of the hill years ago with the 5D line.

So I think 4K is here to stay and camera manufacture will start producing more 4k cameras. Even if the word is not ready to enjoy its full potential it sure is nice to have a a great new creative way to film.

Aron J Anderson

www.aronjanderson.com

Rick Macomber

Bio:

DP/Director Rick Macomber is the winner of four prestigious Emmy Awards, nominated for eight Emmys and ten time first place winner for the Boston Press Photographers' Association, all for his work as a photojournalist at CBS Boston.

His coverage of Cambodian refugee camps in Thailand captured the Best of Show award at the BPPA.

Rick has covered stories around the globe such as the horrors of 9-11 from Ground Zero in NYC to the 50th Anniversary of D-Day from the beaches of Normandy, France. He has interviewed three US Presidents and countless Hollywood and sports celebrities.

Rick is also the owner of Macomber Productions, producing corporate, documentary, promotional and indie films.

Contribution:

I'll probably take some flak for my opinion here... but I've been feeling this way about 4K from the start and I need to release these feelings to all of you so I don't internalize them and end up with some weird disease for keeping things bottled up inside - or so I'm told by the professionals as I lay here on the couch.

Ready?

I don't need 4K yet.

Yeah, I know. I know. I'm crazy. We all NEED 4K!

There's that ability to crop in on shots. That's good to have in the post production toolbox. No doubt. I get that. But is that a necessity? No.

I also get the archiving thing. Again. Not imperative.

Unless you are a DP shooting indie films or Hollywood blockbusters for the big

screen, the pixel density of 4K is still considered overkill - except of course if you enjoy sitting about 2 feet from your TV in order to actually see the difference.

Call me old school. It's ok. Sticks and stones will break my bones but names will never hurt me.

Not all of us can afford to keep up with this absurd game of consumerism. We're not all trust fund babies. Nor do we all have opportunities to test the latest gear and then purchase it at discount rates. Or have wives or husbands who support us while we play "the artist."

Yeah maybe if a 4K camera "fell off a truck" I'd scoop it up. But at this juncture, If the client wants 4K - I'll rent it.

For now... If I need a close up shot, I'll move my sticks in or change my lens rather than spending my hard earned money needlessly every one or two years just so I can say I have the newest toys in the cinematic playpen.

So go ahead people. Get sucked right into the hype. Pull out your credit cards and do exactly what those corporations want you to do. Keep buying.

And next year the technology will change again. They'll be pushing 8K before you know it.

Remember the mantra folks. It's about the story. Not the gear.

So what about 4K? You're dead to me until you become a household name. Literally. I'll keep my profits where they belong. In my bank account.

There. I said it. I feel much better now.

Rick Macomber

Jon Holland

Bio:

Musician/Producer and Photographer/Filmmaker. Recording artist and composer of TV/film and video game soundtracks including ESPN, Sega Vectorman, Ms Pacman and Goosebumps. Lifelong photography, home theater and HD/filmmaking enthusiast. Have attended industry trade shows and conferences religiously for over 20 years. Witnessed almost every minute of the modern evolution and current digital revolution of sound and imaging technology in the pro and consumer markets. Learning new things every day.

Contribution:

To me 4k is a no-brainer.

I absolutely LOVE it.

It is an evolution in image quality that changes HOW we view video presentations. The operative word here is IMMERSION and having the ability to view large home displays and theater screens at much closer distances without the distraction of pixel structure or blur is an epiphany. I was never a huge fan of 3D and I feel that 4k IS that one step closer to three dimensionality and realism that 3D promised in a much more practical form. Sure compression codecs, dynamic range/contrast and color space are all important.

All that will come as camera and display technologies improve and become even more affordable for pros and consumers. I believe 4k will slowly make it's way to the consumers as prices give them higher quality for the same price as last year's HDTV. Consumers will be the ones who dictate whether 4k succeeds ultimately. Give them content (that's where we come in) and the 4k/UHD televisions WILL get sold.

The major electronics companies (Apple, Sony, Samsung, LG) seem VERY committed at this moment to making this happen. BUT. They need content and a delivery format. YouTube is onboard. Netflix. They are all taking this seriously enough to support it.

As far as the tools are concerned... well... hello... Red One anyone? Kicking things

off like...how many years ago? Now we have the Panasonic GH4 and the Sony A7S (soon to be joined by AJA Cion and BMC Ursa) giving us a taste of this world and they do a pretty amazing job from what I've seen.

In the big scheme of things I believe the asking price of this gear is more than reasonable for just about anyone serious about filmmaking. As our 4k post production workflow becomes more affordable and we talk about Terabytes the way we talked about Gigabytes only a few years ago, I believe this will quickly become a natural progression we ease into. If you want more than the cheap price for inspiration just take a trip to your local big chain electronics store and stand 5-6 feet back from an 85" UHD/4k display. Wow. Now do the same with a 1080p television that size. Big difference.

Don't get me wrong, done right 2k/1080p can be a beautiful thing. I have had very few complaints watching 2k theater presentations. That is, until I see 4k presentations sitting far closer (because I can) to even larger screens. It's got a touch of that IMAX magic! That's what does it for me. I own a cheap 55 inch UHD/4k television and have watched both upscaled 1080p and 4k from an average of 4-5 feet viewing distance for months and am amazed at what I see. No pixels at all at this distance.

One last thing to consider. One of the biggest benefits of shooting 4k now is the quality of the downscaled 1080p image. From what I see daily on my 4k display it is noticeably better than 1080p acquisition in most cases. That's reason enough for me. I'm tooling up for a 4k workflow ASAP so I can shoot music videos and other content. I'm confused by all this negative talk about how we don't need 4k.

As a music producer I am equally perplexed by comments that we don't need 24/96k audio when people will end up listening to our productions on mp3/ipod rigs. In my experience people respond favorably when presented with a higher quality alternative. I believe, as content producers we should use every advantage we can to create quality masters for now and the future. Having said that, imagine the 8K demonstrations we've see at CES and NAB as downscaled 4k content. Every little bit helps bring us closer to "being there". Yes, as Ansel Adams said "there is nothing worse than a sharp image of a fuzzy concept", but when we get it right with these new tools it is truly a victory.

-Jon Holland

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Paulie DeCesare

Bio:

Scottsdale, AZ

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Contribution:

Funny, I was just talking with someone about this very subject... 4K is awesome and looks amazing and all that, but 98% of the public consumers don't even know why BluRay exists because they don't know that it's a medium to deliver 1080HD content because they have no idea what resolution means, nor can they explain the difference between DVD and BluRay, let alone 4K.

I STILL hear to this day that the industry created bluray to just cause us to buy movies again. Case in point, I've shot 1080HD for things like weddings and everybody asks for a DVD. The thought of me destroying my work down to 720x480 is sickening but that's all the consumer knows. It doesn't matter what the industry knows or is excited about, it's all taking off so fast that we're leaving the people who BUY this stuff in the dust.

It all started when BluRay was marketed without emphasizing what it is... should have been called BluRay 1080 and the 1080 part should have been hammered down the public's throat so they'd have a clue.

So now 4K comes along, and to cinematographer's they are ecstatic. But, what is the consumer going to know? What on earth is 4K? Is that good? (ANSWER: NO Joe Public, your TV is only 1080, you'll have to buy a new TV and hope your cable company will broadcast 4K once it starts becoming common).

The marketing is a mess... all of us were BLOWN AWAY when we saw Reverie, and it has skyrocketed non-stop, but only to this who create this stuff.

If there's no market, what's the point? Do people buy the fastest cars now that they're available? Nope.

It'll be way too long before the public adopts the hardware in their home to handle 4K on TV or PC. By the time we hit 4K as mainstream we'll already be shooting 12K and the public will say "that's enough, I can't keep buying a new TV for all of these new formats."

Case in point, do today's computers run Quicken and Word and faster? Maybe but what's the advantage? Star Wars in 1080 looks so amazing, how much farther do we need to go if the people are overwhelmed? It'll go solely to appease the desires of shooters, not viewers IMO.

And now we sacrifice what's important to gain 4K... the GH4's 4K video is big, that's all, but it lacks the rich organic sweetness of the 5D3, plain and simple.

I'm not impressed at all by mirrorless cameras, image quality is primo and they ain't got it for video. So what if it's lighter to carry? At the expense of image quality?? I'd use a GH4 in a heartbeat on a drone if I needed aerial but it's not worth the investment because we are getting saturated now by the gimmick of aerial footage with drones.

Basic fundamentals of movie-making still apply and most aerial shooters can't answer the one important question, what was the motivation for the aerial shot? Most say because it looks cool. That's gimmick, and gimmick never lasts in filmmaking.

To me there is only one great thing about 4K video and I so hope it arrives in the 5D Mark IV: The fact that there are vast amounts of image data that can be processed into an amazing 1080HD final product that Joe Public is finally starting to embrace...

sort of.

JPD

Kurt Lancaster

Bio:

Kurt Lancaster is the author of [DSLR Cinema](#) and [Cinema Raw: Shooting and Color Grading with the Ikonoskop, Digital Bolex, and Blackmagic Cinema Cameras](#). He teaches digital filmmaking and documentary at Northern Arizona University.

Contribution:

Why I would rather shoot 2K raw than 4K compressed

I'm reading a lot of hype about shooting 4K. The popularity of Panasonic's GH4 is one such example. Camera geeks are drooling over the possibilities, but I'm not buying it. There are two reasons for this:

The market isn't ready for it.

Uncompressed raw is superior compared to compressed 4K images.

Now I'm making the case here for low-budget (under \$5,000) cameras, those who tend to be the target audiences for some of the 4K hype.

If you're not convinced that there's a market for 4K, bone up on some of the market research:

[“Cutting Through the Hype: Ultra HD Not Going Anywhere Fast”](#) by Troy Dreier at SteamingMedia.com.

Citing Avni Rambhia, Dreier writes:

“If you look at the VOD revenues that ultra HD generated this year, even the forecasts we're seeing for three or four years, they're not particularly spectacular. As far as ultra HD encoding revenue forecasts are concerned, they're less than ten percent of the total encoding market, even if you look four years out,” Rambhia said. “4K TVs are going to be probably less than 5 percent of the total streaming destination.”

And more importantly:

[“The Dirty Little Secret About 4K Streaming: Content Owners Can’t Afford Bandwidth Costs”](#) by Dan Rayburn.

Rayburn states:

“The average broadcaster, news site and publisher, even the large ones, won’t be able to do 4K streaming as the cost for all the extra bits means they will have a content business they can’t monetize. Just think about how much content you view every day, from major content portals, where the max bitrate is 1Mbps. Why aren’t those websites delivering the video in 3Mbps? The answer you get when you ask them is that they can’t afford the extra bandwidth costs associated with it.”

And when you factor in the fact that “the bitrates they plan to use to deliver 4K content, using HEVC, will be between 12Mbps-20Mbps”, then you’ve got to wonder, Why would independent filmmakers, digital journalists, and students want to go 4K if there’s no real market for it?

My answer: Just avoid the hype from the camera and television monitor makers.

I for one would much rather shoot 2K or 1080p HD raw than compressed 4K -- yes, you'll get a sharper picture for HD down-res and yes you can recompose the shot. But is the little bit down-res sharpening worth it? Perhaps. I'm not convinced. Original film is sharp and they always lost their sharpness when printed and distributed to theaters (see "[Cinema5D Interview with Lucasfilm's Mike Blanchard at NAB 2010](#)").

And why do you need to recompose your shot? If you're rushing and not thinking through your shots on set, then ... why are you shooting in the first place? (Ok, we all make mistakes we would love to fix in post, but this line of reasoning could foster a new breed of wanna-be cinematographers not disciplined enough to get it right on set.)

In either case, I prefer to shoot “thicker” images, than something that contains

more breadth of pixels, but are too thin to really make it feel like film.

I like Marco Solorio at OneRive Media. His piece on an early model of the 4K Blackmagic Production Camera is fun to watch:

"Compared to 8-bit DSLRs, this is fantastic. Remember, film isn't about getting a sharp image. The dynamic range is great, but I sense that the image is thin when compared to the Blackmagic Cinema Camera, Blackmagic Pocket Cinema Camera, and especially when compared to the Digital Bolex D16 and the Ikonoskop A-Cam dII. I shot projects with each of these cameras, and they each have their pros and cons, but fundamental to them all is a 'thicker' image, the ability to shape a postproduction feel to your film project."

Take a look at an Ikonoskop example, "[Coney Island](#)" by Jon Yi.

We can see a 16mm vintage film look coming from these shots and the skin tones are accurate. Yi writes:

"The A-Cam DII's image has an inherently nostalgic feel to it, so I decided to shoot this test video in Coney Island using just one simple prime lens to emulate the style of a point and shoot vacation camera. Coney Island is a nostalgic place for me, as it is for many New Yorkers, and it was the first "special" place I took a girl when I moved to New York as a poor teenager. I decided to cast Elle Vertes since her youthful enthusiasm and style fit the part."

And my test of the Blackmagic Cinema Camera, "[Carpetbag Brigade](#)".

I love the thickness of the raw image coming out of this camera. It has texture. From the back of the theater house I was able to get a sharp image on stage. Ultimately the ergonomics are not how I want to shoot.

And another example I did with the Blackmagic Pocket Cinema Camera, "[Magic Vegas](#)".

Again, I like the thickness and texture coming from this image, from the raw elements of the CinemaDNG codec. The color doesn't seem to be as rich as the colors

coming out of the Ikonoskop and D16 Digital Bolex, "[Venice Beach Breakdance](#)."

This film was shot with the beta version of the D16, but as soon as I started shooting with it, I knew I was using something special, something different from any other "electronic" or digital camera I've ever used.

Part of the problem with many of the new cameras coming out is the CMOS sensors (the Blackmagic cameras compared to the D16 and A-cam).

Joe Rubinstein, the president of Digital Bolex and the developer of the D16, recently posted on the Digital Bolex forum on Jan. 14, the importance of the wide range of capabilities when designing the front end of a camera:

"With a CMOS sensor a developer may be able to squeeze the code to get a higher ISO or frame rate if they have left some capability room with the hardware, as we have seen with both Canon and Sony lately. But with a CCD sensor a developer can actually continue to sculpt the code to change fundamental image quality things, almost indefinitely. There are so many subtle ways to control the image. It's really awesome."

The one thing I'll say about Rubinstein, is that from the beginning he wanted to attain a 16mm film look with the D16. He could have utilized nearly any sensor for the camera. He became convinced that a CCD, as an analog sensor, provided the capabilities to attain a 16mm film look more so than a CMOS sensor. The skin tones seem to be more natural, while at the same time when combined with the proper front end design, engages a 16mm film-like look.

Thus, the "thickness" of images coming out of CinemaDNG raw cameras, for me, provides superior imagery to images made from compressed images. For me, that's the bottom line. Not whether or a camera is 4K for a market that's not there.

Rather, when I pick up a digital cinema camera, like the D16, A-Cam dII, or a Blackmagic Pocket Camera, it contains some kind of magic that makes me feel like I'm shooting on film again.

Ollie Dale

Bio:

Filmmaker - DoP - Photographer

www.about.me/olliedale

Contribution:

I have the 4K-ready Sony FS700 + Odyssey7Q bundle. It's awesome, but at the moment my clients only require the 2K quality level. I'm happy with that, because with 2 x 256GB cards I can use the ProRes option and get over 4 hours of 2K RAW footage. It's a workflow dream!

4K? It's here, and some people are utilizing it, but it needs to be 4K from end to end... If anywhere along the way there's a 2K or HD bottleneck in the workflow then the 4K element becomes irrelevant. Sure, shooting in 4K future-proofs your footage, but for what I'm personally doing my clients don't need it, and the workflow on my current setup grinds to a halt editing 4K. To unblock all the bottlenecks would require a major investment and for a small production company whose clients don't want 4K yet, the business decision is easy - stick with 2K for now.

Finger on the pulse - as soon as clients demand 4K that will all change. For now, allow the technology to mature, allow early adopters to work out all the bugs and help shape the next generation of 4K technology which will be cheaper and better than what we have currently.

Ollie Dale

Fletch Murray

Bio:

Fletch is an two-time, Emmy award-winning director of photography. He made two films in college which won awards. Fletch was asked to provide ABC station with Ansel Adams style, out of the box short film essays to end the newscast to increase their ratings. It worked. He was offered free film and free reign of the content. Soon, he was put in charge of the documentary unit.

He has shot over 200 films in 25 countries from commercials for Coors, Kawasaki, Alpine, Universal, Boeing to 90-minute documentaries. His first documentary won the Chicago Film Festival. His last documentary, 'Google Me the Movie', was featured on 'Oprah'.

Fletch has shot hand-held, car-to-car, and helicopter aerals in his award-winning career, using cameras by Panavision, Mitchell and Arriflex in 16mm, 35mm and Cinemascope.

Fletch is also the president of The Association and the founder of the [Cine Boot Camp](#).

Contribution:

4K is eventually going to be the coin of the realm and we'll all want to be aboard for that. But the world we live in right now is 2K.

I've filmed a side by side comparison between the RED ONE MX (filming in 4K) and a Canon 5DM3 using the Magic Lantern upgrade (RAW video 14-bit, 4:4:4 color space, etc.) and by the time both videos ended up in 2K the Canon either matched or surpassed the RED, in my view.

See this video: <http://vimeo.com/77719173>

So for me, I can get the same or better results as a 4K camera right now for the 2K world. Plus I have no odd workarounds, lens crop issues and new platforms to buy. Magic Lantern is free. The workflows been simplified. Plus there are many, many added benefits of Magic Lantern.

By the time 4K is here, Canon will have pulled out a great breakthrough camera

or two. They've done it before and I don't think they'll just close up shop because Panasonic rolled out the GH4. Come on, people. No one else has rolled out three cinema cameras. No one else has rolled out a whole line of cinema lenses. Canon is in the game to win. And they will.

All the best,

Fletcher Murray

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Joel Bergvall

Bio:

Nominated for an Academy Award and winner of numerous international and domestic accolades, Joel Bergvall is a renowned Writer/Director with years of experience on feature films and commercial productions.

<http://joelbergvall.com>

Contribution:

4k is unavoidable. So is probably 8k and 12k and more superhero movies. Does that mean we need any of it?

Of course not. The human eye is incapable at detecting the difference between 2k and 4k from the twelfth row (I'm making up the row number but you get the idea) of your neighborhood multiplex. In fact, you're more likely to notice on your smartphone, tablet or computer screen and since that's how most of us already watch our content, I guess that's an argument in favor of bigger is better.

So is 4k something we want? Sure. It's better, right? Gotta have it.

But let's slow down the hype and think about what we really want. What would actually help us in our work and how we experience the work of others.

Setting aside the obvious and ever changing workflow issues of moving massive amounts of data, focusing instead on the actual image, what tools would you like to have to create it? More resolution? Great. How about dynamic range, latitude, wider color space and sensitivity?

- Dynamic range can help you capture scenes with great contrast. Much like the human eye you could discern the details of a face in the shadow of a doorway on a bright sunny day. Is he sinister? Sad? Menacing? This all sounds pretty relevant to story.

- Latitude can help you salvage that overexposed face for that one shot when the

actor just nailed the performance, giving you that one particular fleeting moment of emotion that helps tell your story.

- Wider color space will mean greater choices for your color palette and the ability to differentiate between subtleties that could otherwise be lost. Did the politician blush just ever so slightly when he lied in your interview? Wouldn't it be great if your camera could capture that so that you can use it to tell your story?

- Sensitivity will help you get shots that were otherwise impossible, using natural environments to light your scene the way the human eye does, giving you usable shots that would have otherwise been so grainy they would have taken your audience right out of the story.

I think there's a pattern emerging... Duh. It's the story!

Will 4k or greater resolution help you tell your story? Maybe. I don't know your story. Only you do. So stop reading technical mumbo jumbo and go make your superhero movie! You're the only one who can.

Cheers

J

Charlie Locke

Bio:

I'm a creator at heart, follow me whilst I shoot, edit, share, repeat!

www.charlielocke.com

Contribution:

4-WHAT?

“THE 4K-DEBATE”

4K is extremely popular and hot on the market at the moment. Not so much sales wise per se, but discussion wise amongst consumers and (more importantly), professionals. 4K has been around for years! (Believe it or not). But only now, has the industry really let it come into play at an affordable price (this is key). 4K has always been there, but it has not been made possible by the insanely high prices put on by under developed and matured companies not having the tech. As 2014 is (almost) coming to a close, and the word is out.

As with EVERYTHING. 4K has it's negatives, but also has it's positives. To briefly touch on these... Data, data data. Data. Data data. Data.... Data. 4K (When done right) DOES consume allot of storage space, and thus meaning it's expensive. It's heavy to work with on your now 'Old-tech' 2014 iMac, and you now need the equivalent of two of last years 'monster-computer's' to edit the stuff, Ew.

In all seriousness, 4K is great. It's undoubtedly the future, and I for one, advocate the use of 4K files in certain scenario's. At the moment, I don't believe it fits in to my workflow (personally). Most of my freelance work is for broadcast, wedding companies and wedding clients themselves. Not one of them is ready to handle 4K files. So why shoot it? The 1080p files I provide them more than blow them away already. In fact, many wedding companies I know still only supply in 480p, purely because that is how the client desires it, to view on their TV via DVD!

Which leads to this; Does your audience have the ability to benefit from 4K? Yes

and no. But the majority I would say “couldn’t tell the difference” (how many times have you heard that in the recent months?).

I’m waiting for the perfect camera body. It’s not arrived yet, and I doubt it will ever come, but I still wait. A compact c300 shell, housing 10 or even 12 bit internal recording to 4K onto affordable yet most reliable SSD drives available in extreme capacities, Including varying frame rates, frame sizes and a usable slow-motion image. No moiré, no aliasing. Customizable peaking, zebra’s, waveforms and histograms. A sharp image, that is gradable, has a gigantic dynamic range, and is the size of a pencil sharpener that you can clip to your sunglasses. It’s not going to happen. Take THAT Google Glass. At least not in the foreseeable future in my eyes (not looking through Google Glass admittedly).

Currently, (at least where I live) Internet speeds simply cannot keep up with 4K if it were to be streamed/Broadcasted. Even if it were, the compression artifacts would make it unbearable to watch! (Speculation, not fact). I just don’t feel the everyday home users hardware to be ready for it (yet), but that’s not to say I don’t advocate the use of 4K to help growth, knowledge and for it to become a worldwide standard.

Personally for my current genre of filming, and my “shooting style”, I am not interested in a camera that shoots 4K, if it can’t do it internally. Something so clumsy, that flaps about like the ma-hoosive Odyssey 7Q, or a slightly smaller Ninja systems, just doesn’t appeal to me. I want small, lightweight, agile, quick, etc.. You get the point. Now for commercial work, sure! But that’s not my thing as of right now.

4K provides much extra cost, however provides the ability to re-frame in post if downscaling to 1080p. It’s starting to become more cost effective, and will obviously BE the future. As it already kinda is. It’s here, and it’s here to stay. Just like when 1080p came into play.

I will use it on certain productions when the time is right or the demand is high enough, however I don’t feel the need to own a capable 4K camera until my everyday clients are asking for it, or expecting it. I think 2-3 years down the line, 4K TV’s will be spread across a large majority of the world, and the industry will be talking about much bigger and better things that totally immerse you into the content, as opposed to damaging your eyes for too much pixel-peeping.

Charlie Locke

charlielocke.com

Percy Fung

Bio:

My name is Percy Fung, Director/DoP

We based in Hong Kong, www.filmmagic.com.hk the production arm of the www.digitalmagic.com.hk

our works may not be based totally on DSLR or 5D

we have works on 4K initially for Theme park works, then cinema, now for TV commercials and now 4K corporate film

Contribution:

As for Theme park pavilion movie, we have done a 4K Stereo movie for the Expo 2010 Oil Industry pavilion

As for TV commercials, just start, shooting in RED Epic 5K 6K and finish in HD, but all archive in 4K current under ProRes 4444 XQ

Last 4 weeks, I have a world filming trip for a 4K TV manufacturer, and filming is to be finished in UHDTV

and playback with HEVC and AJA KiPro Quad

Production has been with RED Epic for 5K acquisition, plus Canon 5D for timelapse and GH4 for limited locations

There are studies in China and Korea for a 4K/UHDTV TV channel

4K TV manufacturing has been keen for Chinese manufacturer, and price is getting much lower, and affordable

One of the well know brand is Seiki 4K, which is also manufactured in UK and perhaps soon in US

All the best

Percy

paul trillo

Bio:

NYC based filmmaker and commercial director. Much of my work has to do with experimentation of both visual techniques and storytelling style.

paultrillo.com

Contribution:

I feel like I was just getting comfortable with 1080 and now I've gotta shoot everything in 4k.

Actually, 4k has been incredibly useful for the 2k work I do because so much of it is post heavy. Recropping, reframing, stabilizing. The extra flexibility has been awesome for all that.

However, I haven't seen the use for it as far as distribution. Sure YouTube has a 4k option but most internet connections and computers can't stream it instantly.

The infrastructure isn't quite there yet but it will be. Anyone who refuses to accept 4k will be the norm soon is behind the times. It took HD a few years to sort everything out.

I've recently purchased the Sony A7S and I can't really believe the quality that comes out of the camera.

The fact that these smaller cameras have 4k capabilities now is a great sign because it means camera manufactures can finally move on to the next thing. I would love to see companies focusing on low-light capabilities. We have huge images but what good is it if we're seeing tons of noise. Sony is on to something and I hope the competition is forcing everyone else to focus on low light and latitude.

Would love to see cameras actually improve the look and feeling of the image beyond the technical specs.

Paul Trillo

mike carrol

Bio:

*Mike Carroll has been a professional TV news photographer since 1983. Since 1989 he has been with KCRA-3 TV news in Sacramento, California. He is also an independent filmmaker and author of the books *Naked Filmmaking: How To Make A Feature-Length Film – Without A Crew – For \$10,000-\$6,000 Or Less – Revised & Expanded For DSLR Filmmakers* and *Breaking Into TV News How To Get A Job & Excel As A TV Reporter-Photographer*.*

Follow Mike at his website nakedfilmmaking.com

Contribution:

When I first heard about the Canon 1DC and saw Philip Bloom's sample footage of Dubai in 4K I was head over heels with desire.

The Ying of this is that I wanted to be able to put out 4K images. The Yang was that I didn't want to shell out \$11,000—plus a lot more for lenses.

At the time I was putting together a script for the next feature-length film I wanted to make. I've made three feature-length films, a documentary and two dramas and written a book about how I did them all as a one-person filmmaker without a crew to encourage other filmmakers and aspiring filmmakers to make their own films and for a fraction of the money that so many other unknown indie filmmakers plop down. My films had been shot in 4:3 Standard Definition, then in 16:9 24p Standard Definition, and the last in 720 24p HDV. After the last film I'd dived into the DSLR world with one of the first shipment of Canon 7D's to arrive from Japan. I wanted the whole interchangeable prime lenses + shallow depth of field thing for the next film I wanted to make, which would be shot in 24p High Definition.

(Side Note: I also often bring my \$1,600 Canon 7D with me on TV news assignments and mix HD footage from that camera with footage shot with \$60,000 Sony CineAlta HD XDCAM and it's amazing to see how seamlessly the \$1,600 and \$60,000 footage integrates.)

But then Philip Bloom's Canon 1DC bombshell landed and I was ripped apart by fragmentation.

Whatever film I was planning to shoot in HD—note: one of my feature films takes two or more years to complete—would be visually and technically outmoded by the newer, more quickly made 4K films I'd be competing with.

Putting 4K in Cinematic Historical Perspective

If you think I'm sounding over reactionary, consider this: If you go to see a movie today, at a film festival or on Vimeo or Video-On-Demand (VOD) and it's obviously a 4:3 SD movie, don't you almost have the feeling like you're watching some old thing shot on ¾" Sony video? I sure do. It would be like starting to make a movie in 1926 with a wind-up camera in silent black & white and then not having it finished until 1928 or '29 when the audience only wants to see talkies and there's already buzz going around that color is only a year or two away.

Here's another analogy: try selling people on a new phone that only works when plugged into the wall and has a rotary dial? Oh, and it doesn't work anywhere except that one wall outlet. No taking that phone with you. And not text. No built-in camera. No voicemail. No Internet. Nothing else. It's only good in that one place when you're talking into it. If anybody wants that then welcome to the 20th Century.

This explains why, after seeing that first 4K footage of Dubai, I decided to table my film. First, it's not a time-sensitive story. I can make it next year, or the year after that. Also, the 4K floodgate was cracking open. The new benchmark had been set. More cameras would be coming. Just give it a year. Wait for the next NAB.

Keep Calm & The Price Will Drop.

In the past year the 4K BlackMagic Production Camera has dropped from \$3,995 to \$2,995. (Who knows what may be next in store as their popularity keeps taking off, keep introducing new cameras, and keep slashing prices.)

Then the Panasonic GH4 for \$1,699. For my purposes I wouldn't need the \$2,000

attachment. Shooting to the chip would be fine. And with software modifications and upgrades and downloads and hacks—who knows what that camera will be capable of.

Next year's NAB will no doubt have 4K everywhere from all the name brands—Canon, Nikon, Sony, GoPro. They don't really have a choice if they want to keep selling cameras.

The Real Game Changer: Consumer 4K UHD TVs

Over the past year 4K UHD TVs have been dropping lower—getting closer to I-gotta-have-one prices.

I saw my first 4K UHD TV a year ago on display in Fry's for \$4,800. Now Costco has a couple for under \$2,300. By Christmas—and certainly by Super Bowl 2015, which sells more top-of-the-line big screens than any other single event—I expect to see 4K UHD TVs for \$1,995, and even \$1,799.

Also, look for the Super Bowl to be broadcast in 4K. Some elements of NBC's Sochi Olympics coverage were aired in UHD. You can bet this monster event in the U.S. will be all-4K.

I think these my industry predictions are pretty obvious—and extremely reasonable.

Anybody who wants to bet against this, I'm sure there are plenty of Las Vegas bookies ready for some easy money.

4K Makes My Images Competitive with Hollywood

I'm a filmmaker. I'm a cameraman. I want the best picture I can possibly get. And 4K is pretty extraordinary.

Up until just a few years ago, to have a top quality image projected on a screen in a cinema you needed to shoot on 35mm with Panavision or Arriflex cameras or lenses. This meant film and processing and assistants for lugging and helping to

focus and push the dolly and on and on—and then to get it shown anywhere you needed and established almost mafia-controlled distribution system. In short, a Hollywood studio. Or an independent studio, which would only stay in business by either being funded by a major or to sell their indie production to a major later on. In short, there wasn't much of a playing field and only a handful of teams to try to get onto. And they were all in a fairytale town called Los Angeles, which has a well known reputation for having open arm policies for receiving and financing new and inexperienced filmmakers with heads spilling over with dreams.

Don't go thinking I'm an anti-film guy. I am the only filmmaker/cameraman I know who actually owns his own 35mm motion picture camera—a French-made 1950s 35mm Éclair Cameflex CM3—the same camera that Orson Welles, Francis Ford Coppola, George Lucas, Haskell Wexler and Claude Lelouch shot their early mainstream and independent movies with. I'd love to make my own film with my 35mm Éclair but, short of winning the lottery, that ain't happening.

Unquestionably, one of the greatest films of all time is Stanley Kubrick's 2001: A Space Odyssey, shot in Super-Panavision 65mm, projected on 70mm. (The extra 5mm were for the optical soundtrack on the release prints.) Recently MGM had 2001 digitized to the equivalent picture quality of the 70mm film. That digital print, which is being projected on big, big screens at widescreen film festivals, is 2.5K.

So, for under \$3,000 or less than \$1,700 you could shoot your own movie with the picture capabilities of an Ultra-Panavision camera. There are certainly aficionados and technoids who will argue with me on this—or club me with an Ultra-Panavision camera—but any one of these new 4K cameras would unquestionably get you into the big screen ballpark.

(Note: I'm not suggesting that my next film or anyone's film, by the very nature of it being shot in 4K would automatically get theatrical distribution. I knew enough filmmakers who made admittedly terrible movies, yet still were confident (arrogant) enough to boast that they would get picked up simply because they had a 35mm negative. Honestly, I think more people are watching films through streaming, like Netflix. That's the future. Theatrical films, for the most part, are 2-hour commercials for when they are available on-demand, for streaming, DVD, Blu-ray, etc.)

You CAN Make A 4K Feature Film For Less Than A Used Smart Car

As an independent one-person no-crew filmmaker who makes his own films with his own money, this is incredibly alluring. You don't need to sell your soul finding or deceiving investors. You don't have to go crawling to mommy and daddy (unless you're still in junior high school). You don't have to go to anybody. You can be truly independent.

It is possible to make a feature-length 4K film for less than the cost of a new Smart car. If you already have some gear—a few lenses, microphones, a digital audio recorder, a computer, editing software—it's possible to make a feature film for less than a used Smart car. Maybe even cheaper than that.

The only place you have to go is to the camera store, either a walk-in or online.

Get Your 4K Film Online—Such As Netflix & Amazon

To get your film, your art, your precious baby seen, you don't have to go begging anymore. There's Vimeo. Youtube. Amazon (Createspace.com). iTunes. And a constantly expanding field of online aggregators and distributors who will assist in getting your films out there for a fee of only a few thousand dollars. As more of these intermediaries pop up the prices will only get more and more competitive.

Starting with the 2013-14 season of original programming from Netflix and Amazon, including House of Cards and Orange Is The New Black, everything has been produced in 4K with eyes towards the future.

I have every confidence that as Netflix continues to become the new powerhouse for entertainment distribution, and even financing for production, that a doorway will open for independent filmmakers to get their work seen and share in some of the of streaming revenue dollars.

As a filmmaker who sells his films on Amazon in the forms of DVD-R and for sale and rentals through their stream, as technology improves I am optimistic that I will eventually be able to get my work out, sold and seen in 4K.

(Warning to Filmmakers: keep in mind that financial returns for indie product is small, tiny, minimal, asterisk-like, a single grain of sand on a beach of pebbles, stones and boulders. Forget those great expectations of financial reward. Keep good accounting, save all your receipts and get what percentage on the dollar back from your tax returns that you can. Another reason for making your film with little-to-no-crew—and save on meal costs, if nothing else.)

By invoking cinemas projecting in 2K not I am trying to suggest that indie filmmakers are going to, by the very nature of shooting their dream/art/epic in 4K will crack open the nut into mainstream multiplex theatrical distribution. No way. I may be crazy, but I'm not delusional. (I'm writing this at the crack of dawn and never have a martini, shoot up smack or start ranting about annexing Poland before five o'clock.) That said, I have been in a number of film festivals where sometimes they rent out a screen at a regular cinema or multiplex, so having your film projected once on a professional screen in 2K is quite possible*.

(*Now that cinemas across the U.S. and around the world have converted to digital projection, where the vast majority of movies are being projected are in 2K.)

If I Were Shooting A Movie In 4K Today

If I had to start shooting a film today I'd probably go with the BlackMagic Production Camera shooting ProRes 4K. I'm impressed by the BlackMagic Design people and their continuous software upgrades for their products, showing to me a commitment and dedication to the customers of their products.

I see online distribution changing radically. And in the very near future, one or two years, I can see 4K online and VOD distribution opportunities. How could any filmmaker not want their images to be competitive with the best images coming out of Hollywood? With the 4K cameras available today, and the next 4K wave hitting the beaches next year, plus what post imaging software like Da Vinci Resolve (another BlackMagic Design product) that can really push your images into the stratosphere— how could any filmmaker not want to get it on this!!!

I know that I sure want to!

In the meantime, I'm pecking away on my script. Biding my time. Confident in the amazing—and amazingly affordable!—cameras, software and online distribution possibilities that are JUST around the corner.

Mike Carrol

jem schofield

Bio:

Producer/Director/Educator

Founder » theC47 / The Filmmaker's Intensive

Jem Schofield is the founder of theC47, an online and offline educational resource focused on teaching the craft of video production and filmmaking (with production based workshops taught throughout the United States and abroad). He is a producer, director & educator and also runs The Filmmaker's Intensive, a bi-annual program that focuses on the art & science of documentary & narrative filmmaking.

For the past 18 years his company, Buttons Productions, has produced projects for an ever expanding client base. Clients include AbelCine, Apple, Inc., Canon U.S.A. Inc., EMI, Manfrotto, The Motley Fool, The New York Times, NPR, TED, Tiffen & Zeiss.

For more about Jem & his whereabouts visit theC47.com

Contribution:

A 4K Future

The times they are a-changin'.

An increasing amount of today's content that is captured for feature films, episodics, commercials, sporting events and visual effects is acquired at resolutions higher than Full HD (1920 x 1080). A lot of content like sporting events, feature films and commercials are still being delivered to broadcast and the web in HD but the actual "digital masters" for a lot of this content is usually finished, output and archived at much higher resolutions so as to "future proof" it for future distribution channels that support either Ultra High Definition (UHD) television at 3840 x 2160, or Digital Cinema Initiatives (DCI), 4K at 4096 x 2160.

As a producer I have to consider each production and what the best resolution for acquisition should be (in addition to the quality of the image captured in terms of

dynamic range, color space and compression). My main deciding factor is usually the shelf life of the content I am producing. If its short term (1-2 years), then I feel Full HD (using the right camera systems), is the way to go. If its long term or has special applications such as visual FX or the need for reframing in post, then UHD or 4K is generally the way to go. If you are creating digital content that you want to survive, this is something that is very important to consider.

UHD will most likely become the standard resolution that most “4K” content is acquired as it retains the 16:9 aspect ratio that we adopted when transitioning from Standard Definition to High Definition. This is important as most television panels will be UHD so that Full HD content will also play properly on those screens. DCI 4K will be mostly likely be used for feature film acquisition. Both will be referred to as 4K in the industry.

Just make sure that you choose the right camera & resolution for your job (not always 4K), and try not to get in the habit of reframing your 4K footage all the time for Full HD projects as you’ll run into big issues when a client asks for a 4K version of the same project. You’ll also find that once you start down that reframing in post road that when you start producing UHD or 4K content as a standard (which you will one day), that you will need to buy 8K cameras just so that you can reframe your content for 4K distribution. It’s a great option to fall back on for certain types of projects but it can also be a dangerous and costly habit.

With H.265 compression, systems that can handle 4K resolutions at speeds similar to HD, drive space costing less and cameras that can acquire high quality UHD and 4K content at an affordable price point (similar to Full HD acquisition), it looks like 4K is here to stay.

Even when you are posting a project at a lower resolution that it was acquired, try to compose your shots with intention in production. If you do then everything will run smoother in the long run.

Happy shooting!

-Jem Schofield

Barry Andersson

Bio:

Barry Andersson is an award-winning director and cinematographer.

His career started with live television video production and now includes an ESPN 30 for 30 documentary, several acclaimed short films, a couple television pilots, numerous commercials, and a feature film.

Mr Andersson takes his real world experiences and shares those images and lessons with everyone from the US Marine Corp combat camera teams, many of the leading teams of the four major sports leagues, leading universities around the US as well as leading productions looking to take advantage of the latest technology.

Contribution:

Current State of the Industry and 4K?

My opinion is that 4K for the vast majority of work is still several years down the road.

I work for a variety of clients but I still have yet to have any clients hiring me to shoot 4K. On the flip side this is the year they are starting to discuss with me about the future and trying to figure out a workflow and a timeline to adopt 4K. So the needle is finally moving in the direction of 4K being here as a main production tool. As I see it now the main gigs shooting 4K are stock video, VFX work and archival footage (i.e. NFL films etc).

There is no current mainstream 4K distribution channel nor do I believe there will be one in the next 2 years or more. The reason for people to look at shooting 4K now in my opinion (ignoring this if your clients are demanding you shoot it) is for the following reasons:

- The ability to crop in post.

In the sports world many of the scoreboards around the country are still 720 boards. So a lot of organizations have been shooting 1080 and cropping in post so

they can repurpose footage. As the scoreboards get upgraded to 1080 (and in some cases 4K boards) a lot of these organizations want to keep the flexibility to crop in post. So they are moving toward shooting 4K so they can crop in post for their 1080 boards.

- Extending the life of your camera.

I have never been a huge fan of the Canon C300 but at this current time I can't imagine someone investing that type of money for a camera that doesn't shoot 4K and can't be upgraded. The Sony F5 is only a couple thousand more and you can record to an external recorder and shoot RAW 4K video. This is huge for people trying to extend the life of their camera and squeeze every nickel out of their camera purchase.

This isn't a shill piece for Sony but the F5 now gives you a path to upgrade to the F55 so if you need to upgrade again you don't need to buy from scratch. In the current economy those that can keep their equipment working more often and can extend the life of those items will win. If you are locked into a camera that doesn't shoot 4K and you don't plan on using for more than 2-3 years then you are making a mistake in that purchase (again the exception is if your clients demand a certain camera for their workflow.)

Am I currently shooting 4K?

2014 is the first year I have started to shoot 4K. However, this is for my own learning curve and to do the prep work I know my clients will be calling me for soon. I have yet to get paid to shoot 4K footage of any kind. You know your clientele the best and so you need to gauge how soon they will be demanding you to shoot 4K. I have some clients that won't accept RAW files in 1080 because they don't want to deal with transcoding or the extra storage space.

What are my plans for shooting 4K and the future?

I believe that if you don't adapt and stay current you will lose clients. I have many friends that didn't want to learn new cameras or workflows and they are almost out of work. I think it is important for you to keep current for your job. On the flip side you need to make money. Don't invest in a lot of equipment (new camera, new cards, new computer, new hard drives etc) if you won't be getting paid

for the foreseeable future. Buy closer to the point where your clients will pay you for that. Find ways to rent or borrow a camera and start playing around. Maybe shoot some test shots for your biggest clients and show them the benefits of shooting 4K and you might be able to convince them to switch sooner than they planned.

However, DO NOT recommend to them to shoot 4K just because you want a new camera or want to charge more money for the camera rental. If they don't see the benefit someone else will convince them they are wasting their money and you will lose your client to them.

Keep your client and paying gigs in mind and let that drive where you are going. That is exactly what I am doing.

Barry Andersson

Barryandersson.com

John Brune

Bio:

I'm a 25+ year video professional running my own video production business in Indiana.

I'm a videographer/editor and a proud recipient of three Emmy Awards. I produce, shoot, and edit television programs, commercials, web videos, industrial/product knowledge videos, demo/training videos, documentaries, and trade show/expo videos.

I put your ideas in motion.

johnbrunedigital.com

Contribution:

Where does 4k video fit in your daily work (or not)?:

4K does not fit into my daily work at this time.

Explaining the reasons for this practically answers all the other questions in the process so here goes: First of all the cost of 'upgrading' to 4K is prohibitive with my current budget and workflow. 1080 HD works just fine for me and clients don't really fall over themselves asking for that--they just expect clean quality video. To me 4K is a format that is too much too soon and should be reserved for large venue screens. I would have to buy a new computer, new camera, new hard drives--essentially replace my entire (perfectly working) workflow just so I could attain bragging rights of producing in 4K. So yes it increases my costs -- and my edit and transcode times.

But if I move to 4K I will not raise my prices--I'm competitively priced and I'm not going to mess with that (why should the customer pay for my decision to 'upgrade'?). 4K would provide nothing extra for me at this time except the need to buy more hard drives and memory cards. It is my belief that the sudden push for 4K is singularly created by manufacturers of 4K cameras and 4K displays--and those that report on it in the media.

The regular consumer doesn't give a shit about 4K. The general public doesn't

care about 4K either. Have you ever traveled thru airports or hotels anywhere in the U.S.? Notice that all the HD tv's mounted everywhere are usually displaying letterboxed standard definition video in stretched 16x9? That's because the general public perceives HD that way. The general public and EVERY single one of my clients still think DVD is HD. No customers are demanding 4K. None. I don't expect them to in the near future either. In the last 7 years I've only ever had 2 clients come right out and specify they wanted HD. I could have shot video for all of my other clients in 16x9 standard def and they wouldn't have noticed.

A friend of mine owns a GH4 and loves it. He has sold all of his other camera systems except his Canon 5D III because he likes the GH4 so much. I'm not convinced that the GH4 shoots clips longer than 30 minutes without overheating--a feature my clients need on almost every shoot! I'm planning on buying a second Sony NEX FS100 for my work--an ugly camera on the outside with a great imager on the inside. I couldn't be happier with the workflow that I have from the Sony FS-100. It's the kind of video I could only dream about shooting when I started in this business over 25 years ago. No 4K for me in the immediate future.

John Brune

Hugh Brownstone

Bio:

Hugh is a corporate escapee and founder of Three Blind Men and An Elephant Productions, a small company with a big animal logo and a mantra of “authenticity, humanity and wit.” He and the team write, direct, shoot, and edit web-centric films; conduct photo shoots; write copy and white papers; and blog. He also consults on strategy and branding.

3bmep.com

Contribution:

4K Isn't Just About 4K

The Canon 5D Mk II changed my life.

It gave me the courage to chuck everything I'd done in my professional life to that point and turn a life-long passion as a still photographer into becoming a filmmaker.

I'm still working on that, with joy, every single day.

But at the end of 2013 I downsized from the 5D Mk II with Magic Lantern to a pair of tiny Rebel SL1's, because I thought it was (and it is) a superior video machine at an astounding price point – freeing up budget for other tools (like more lighting, more glass, more support, and more training).

And the dirty little secret was: if I wasn't happy with the severe (for a still photographer) limitations of what was supposedly a high definition format in terms of sharpness, tonality and ability to do things in post (don't even mention focus), I could at least re-deploy funds to make the initial capture -- outside of the camera itself -- better.

After all, how could someone coming from the raw workflow of 21MP still images be happy with the H.264 codec while contending with all of that OTHER

stuff in filmmaking – like audio and motion for chrissakes?

While Magic Lantern RAW entered the equation briefly, I concluded it simply wasn't feasible for me to devote the time and money in post to this incredibly powerful capability that the ML group was making progress toward every day, especially when it wasn't production robust (and remains so as I write this).

So when the reviews starting rolling in about the Panasonic GH4 and then the Sony A7s (I hadn't paid much attention to the Blackmagic 4K camera because I was already leery of HD ProRes or raw workflow), I gorged on every article, review and piece of test footage I could find.

The footage is what did it.

I decided to switch brands, take the depreciation hit before it got worse, and embrace 4K not because people were watching 4K, but because it made HD much, much better – better than I could get with the first two rungs of Canon's EOS Cinema line, for much less money.

But in the process of educating myself – and getting exceptionally clear about what my actual needs, budget and capabilities were – I stalled as I asked even more questions.

What lenses would I actually use with these new bodies? And then: what lenses were even available for these new bodies? What would I be giving up? If I were to make the switch, what else would I want beyond just 4K – like dynamic range and low light sensitivity – and how much would it REALLY cost me to get to 10-bit 4:2:2? What were the weaknesses in the Sony and Panasonic lines? What about taking another look at the Black Magic 4K camera, where I could most easily leverage my investment in Canon glass?

Would I be willing to go back to one camera, or could I afford two?

And of course: how soon would Canon come out with its own reasonably priced 4K camera (as of August 2014, many of us were looking to Photokina in September with bated breath, wondering if the rumored 7D replacement would actually show

up, and if it did, would 4K be part of it?).

Where would my work be viewed, at what size and in what resolution?

Then: could a different codec with a workflow I could live with achieve the same thing at 1080p as 4K?

Finally: how much better a technician could I become with what I had -- and how much of a difference would that make to my final cuts?

Ultimately, I asked myself the same set of questions which led me to downsize to the SL1's, and I came up with a conclusion that surprised me:

For right now, the best use of my funds and time – matched to the needs of my business and my personal artistic sensibilities – is to get the best footage I can from the cameras I have.

Make ME better.

And make sure the stories I tell with whatever gear I have are absolutely the best they can be.

Because that's what it's really all about.

Will I go 4K? I'm sure I will. But it looks increasingly likely that this is a 2015 or even 2016 proposition.

In my middle age, I find to my utter amusement that I've moved from being an early adopter to someone happy to wait a little bit longer on the gear – and instead move full speed toward skill mastery.

After all, Cartier-Bresson did incredible things with 35mm Tri-X film, a 50mm lens, and a camera that could only adjust shutter speed; accept the lens; and wind and rewind film.

Yeah.

Steven Schwartz

Bio:

Based outside Washington, DC, Local Flavor, LLC produces videos and writes articles about local businesses with a specialty in local food, wine & spirits. We began making videos for extreme sports – adventure races, triathlons, and the X-Games where we learned to be ready for those brief moments, or risked missing the shot! We make videos for companies, farms, and artisans. It's all about Local Flavor to us.

LocalFlavor.tv

Contribution:

I miss my Sony EX1r dedicated pro video camera. Built-in dual XLR's and manual audio level controls, onboard ND filters, easy to handle ergonomics. Gave all that up for an out-of-focus background. DSLR's are a real pain in the ass. But I'm hooked on those luscious pictures.

I pray that Sony will soon build a camera shaped like the EX1r (that fits into a small backpack and pulls in and out easily) with interchangeable lenses, super-low-light sensitivity, full-frame sensor, 4k internal recording, NEX mount fitting all the lenses in the world, 100 mbps, time code, and all the goodies – all for under \$5000 - 6000. And I'll buy it in a heartbeat and ditch my DSLR's for video forever – can't wait to lose the 15mm rods and all the silly accessories.

Like you love your Canons, I love me my Nikons for stills.

Steven Schwartz

Kelly Guenther

Bio:

Kelly is a Seattle-based Emmy-Award-winning photojournalist and visual storyteller who owns the boutique production company, Guenther Group.

Contribution:

The State of 4K

We're a small production company specializing in corporate videos. Much of what we create ends up online. Typically the highest end uses of what we create are motivational company messages or stories at big conferences where they are streamed onto screens about a 1/3 the size of a football field. But even then we are looking at H264 compressions -- and they look great. What we have found over time is it's not so much the resolution as the glass we're using.

So to 4K or not to 4K? We're holding off. It was the same for 3D just two years ago. We didn't find that our clients used it or cared to use it -- even as a novelty at conferences. And the bottom line for us is client demand.

We are considering the GH4 to shoot 4K b-roll. Having a camera capable of 10-bit 4K output trumps the A7s in our opinion. Selling stock footage is a small revenue generator for us and 4K footage simply sells for more. Also, the size factor is key for this. Anything that passes international customs without a 2nd glance is hugely beneficial since we don't have to bother with carnets, and we do a fair amount of international work.

Having said all that, for all of our domestic work, we're keeping our eyes on the Cion and possibly the Ursa. Why? We'd like to be 4K ready if and when we head that direction and we can use our existing investment in expensive glass.

But Blackmagic has got to fix their black hole sun issue before we invest in more of their cameras.

We also like the fact that AJA is marketing the Cion as an either or camera, either

HD or UHD. And we love the fact that upon delivery it will be capable of 120 fps.

Kelly Guenther

www.guenthergroup.com

Royce Allen Dudley

Bio:

*Director of Photography
Porter Ranch CA
www.FeatureFilmDP.com*

Contribution:

I own no 4k solution ... yet. I shoot for a living in the most competitive cinematography market (L.A.) mostly on corporate and infomercial, and occasional music videos and indie features (I used to shoot 3-5 features a year but indies today rarely budget for professional DPs).

RED* cameras alone have served the need to date for clients who demand 4k origination. The Ursa, like the other BM cameras, does not appear to be designed with the input of any cinematographer (i.e poor UI and ergonomics). The GH4 shows promise as a cheap 4k tool but its small form factor and chip size create 2 issues for many clients; need for unfamiliar lenses, and the "toy" appearance. I have found that since film vanished overnight in 2007 in my own world, clients have very specific expectations based on both news articles and web forum threads... something uncontrollable for the shooter. What I prefer or recommend is pointless 9 out of 10 times as people have made an almost emotional pre-selection of camera system prior to my hire.

* Interesting how RED one changed the market while being a clumsy, clunky Beta tool, and also how it was abandoned overnight on release of Epic... impossible to take a RED one on to a set for pay now. Digital camera have a short and unpredictable demand life unlike film bodies which worked literally decades.

Many people ask for 4k and then settle for CANON DSLRs which is like going to a Ferrari dealer and driving out with a Honda, but it happens almost regularly. Price, crew and post are the reality people discover.

Makes me unlikely to buy high end gear ever. I only buy grip and lighting gear as a DP.

A 4K APS C or full frame DSLR from Canon with good color space and sensitivity and a global shutter would be an exception... I could own that.

Royce Allen Dudley

Danny Grizzle

Bio:

Danny Grizzle

Media Mogul Productions

Longview, Texas

Contribution:

Too many people are hung up in a chicken & egg conundrum about 4K, asking themselves, "if there is no 4K distribution, why produce in 4K?"

This is a no-brainer, if you ask me. My reasons:

1) It is always better to originate at higher resolution than the distribution format.

This has been proven time after time in the production industry. The only exceptions would be things known to be one shot use.

2) Many reviewers note that compressed 4K (GH4, particularly) looks as good or better when reduced to HD than lightly compressed (ProRes) HD originals. Moral: 4K production does not necessarily require radically retooling the entire post production workflow, and can be eased into without huge penalties in storage costs.

3) 4K origination seems vastly superior for any application that requires stabilization.

4) On HD edits, 4K gives additional editing options to punch in and reframe shots. I'm an advocate of doing it right in camera, but it is always nice to have a safety net in post.

5) 4K viewed side by side with HD makes HD look shabby. That's all things being equal, bit depth, dynamic range, etc. There are a lot of detractors, and perhaps some case that increased bit depth is essential at 4K because, after all, there are more pixels to reveal artifacts such as banding. These arguments do not negate the fact that producers should be moving to 4K, even if only originating for HD distribution.

It is better to surf the wave than to be wiped out behind it.

6) Today, the price of 4K displays is too high for the mass market, though that could change at any moment as display manufacturers retool their factories and one of the players sees a competitive advantage in aggressive pricing to gain market share. The consumer market is more volatile than the professional market. However, 4K when priced right will be compelling to consumers because the marketing message is very simple: "4X the Quality of HD." This is a perfect fit as a clearly superior spec that is actionable by consumers.

7) When market inversions occur suddenly, as 4K potentially will, the professional production business is very vulnerable to making bad calls and suffering the consequence of failed business models.

8) 4K represents a business opportunity for producers. There is a lot of production outside mass market distribution channels. The 4K savvy producer can sell into markets which have a captive exhibition space. This is where I am right now. Because my main client has showrooms, and visual imaging is a key factor in their marketing, I am in a position to specify 4K monitors and design an end-to-end 4K solution. It makes business sense today, and the client benefits by being an early adopter and the wow factor it will deliver to their customers. Producers should look for anyone who would benefit from imaging quality above and beyond cable TV, real eye candy to capture and hold the attention of consumers. Many video producers have already had this experience at shows such as NAB, where I have seen 4K alongside HD. This technology does not benefit only the production industry. A good place to begin prospecting is the event calendar of any major convention center in the country. See what shows are there throughout the year, then look at the exhibitor list. It is a ready made prospect list for organizations who would have an immediate interest in 4K production.

Danny Grizzle

Mike Tesh

Bio:

Director of Photography (8 years)

By day I light and lens corporate videos for clients that include the Detroit Symphony Orchestra, Chrysler and countless others. Including directing the other camera operators that work with me on these projects.

At night I am an indie filmmaker who writes/directs/shoots my own projects on shoestring budgets.

I have one directors credit to my name for a feature film I made back in 2003.

I continue to look for the time to pursue my indie film hobby which is hard to do with my busier day schedule.

<http://www.imdb.com/name/nm1582858/>

Contribution:

I think 4K(+/-1K) digital acquisition is the new 35mm negative. In the same way that for decades super35mm film has been able to capture around 4K resolution, it has always been transferred to a lower quality display format. Either film prints that hover around 2K or video formats at 2K or below. Yet that higher resolution aesthetic quality still shines through. As can be seen by any DVD (or even VHS tape) with a Hollywood film on it compared to a home video.

I'm not convinced 4K distribution is going to make a huge impact on the consumer, besides being another numbers game in the marketplace. If consumers even care enough about that. Which I doubt. Especially in a world where we've had blu-ray since 2006 and yet DVD is still considered "good enough" for most consumers. I have never once had a client ask me for a blu-ray, but just yesterday I burned two DVD video discs. This proves to me that the majority of people either can't tell the difference or just don't care.

Optical media aside, most of my deliverables are MP4 files in 720p. Most of them go straight to YouTube at an even higher compression than my already highly compressed Canon cameras record. But again, the mass majority of my corporate clients don't even specify an output resolution. I provide 720p HD because it makes sense to me. Only a few clients in my eight years of doing this have asked for a

1080p file. Even then, that was usually to meet a default spec set by another video vendor the client was also working with.

So where does this leave 4K? As I said, I see it as the new super35 negative of the digital age. A way to obtain a higher quality HD and SD image. Maybe even a way to give me a little more working room when it comes to cropping.

I think 4K makes sense in a larger cinema. But again I question whether most consumers will see the difference without something better right next to it to compare it to. I think any filmmaker will be able to get away with providing a 2K DCP for years to come. Even to theaters with 4K projectors.

As a guy who produces content, I am happy paying \$10 to see a 2K image on a cinema screen. Its really no different than what I've ever seen in the cinema while growing up with film projection. Except without all the marks and scratches after a few showings.

I think 4K makes the most sense as a computer display resolution. But again I think the mass majority of consumers would full screen an HD video on those 4K monitors and be perfectly happy with the results. A moving image with motion blur is not fixed like menus and icons. Its in those fixed elements where 4K would be the most apparent.

Overall, I think we reach a point with every technology where the perceptible quality reaches a threshold beyond which the average person cannot tell the different without investing some serious coin in playback hardware. For audio playback that was the CD. We then made it more efficient and practical with the MP3. For video I think that is Blu-ray 1080p at home and 2K DCP in theaters, both with their higher bitrates. We then made that more efficient with lower bitrate MP4 files and streaming services like YouTube, Netflix and HD cable. So I think that even when we get to the point where everyone has a 4K TV (simply because you can't buy a TV that isn't 4K), the mass majority of people will still be playing DVD discs and HD streams and be perfectly happy.

Mike Tesh

Ignacio Artiñano

Bio:

Related with the photography world since 1975 and with the video since 1985 I've been involved in the a different kind of projects: Documentary, educational videos, corporate...

Contribution:

About the 4k coming, or best said, already arrived, I should like to said that in my modest opinion, is here to live with us for the next years.

I'm one of the Canon 5D to Panasonic GH4 switcher. I've being with Canon 5D2 since it appear and we bought one of the firsts camera here in Spain, even more we also get a second 5D3 body and several original lenses and stuff: jibs, SDD recorder and so on...

Now that we are working with 4K

I've to said that the gap between those two formats is the same that I found when the 5D2 was released and all of us sow the demo of Vincent Laforet video and the HDV fixed lens cameras. So, once recording since a couple of months with it I definitely bet for the 4K.

No doubt!

Ignacio Artiñano

Julien Lasseur

Bio:

After graduating with a degree in Art History and Visual Arts, he pursued a 3 year apprenticeship with cinematographer Shane Hurlbut ASC. Julien has traveled the world shooting commercials for Samsung, McDonalds, IBM, UPS, among others. He has also directed a number of projects including music videos for Universal Republic Records, commercials for JBL and Infinity, and documentaries such as Brendan O'Connell Is Blocking The Bread Aisle (2013). His work has been exhibited in numerous festivals such as Camden International, Mill Valley Film Festival and Heartland international among others.

www.julienlasseur.com

Contribution:

4k video is a great filmmaking tool.

With higher resolution projection and web exhibition, it seems like the film/television/commercial industry is undoubtedly moving away from good ol' HD.

While 4k video demands a large amount of storage and should be carefully considered when budgeting post production, overall storage costs seem to be steadily declining, thus making it more accessible.

The ability to reframe and stabilize while maintaining a high resolution picture is a definite benefit of this medium. Right now, I'm waiting for Canon to present a c500 option with 4k internal recording capabilities.

I recently finished a comedy short with an NFL star that we shot in 4k and it is now available on YouTube at 4k! (<https://www.youtube.com/watch?v=1sOilV8XbMI>) This particular project was shot using a RED Epic with a Dragon Sensor. Check it out if you're interested in seeing what YouTube 4k looks like!

Julien Lasseur

Jared Abrams

Bio:

Jared Abrams is a Cinematographer based in Hollywood, California. He currently runs Wide Open Camera, a small design and production company focused on the independent filmmaker. He has worked on many films, commercials and music videos.

www.wideopencamera.com

Contribution:

Here is my take on 4K.

Many years ago while working on the kids TV show "Reading Rainbow" I made the bold statement that film was around thirty five hundred lines of resolution. Talk to me about video when its gets close to that!

Well here we are.

The resolution and detail that can be pulled out of a 4K video image is as close to film that I have ever seen.

The newer crop of 4K capable cameras have finally hit the street with a fairly inexpensive price tag.

The new Panasonic GH4 is currently my weapon of choice. The ability to internally record 4K for under two grand is a huge step forward for the independent filmmaker.

This enables us to produce stunning images that rival film for a fraction of the cost.

Now it's just up to you to tell your story.

Jared Abrams

Frank A Rybicki

Bio:

Producer, field recordist, sound mixer, and boom operator from Groton, Connecticut

www.1-in-10.com

www.studio2group.com

<http://www.stage32.com/profile/78824/frank-a-rybicki>

Contribution:

There is no question about it, 4K changes the game. Rented a GH4, it was amazing. then rented a Sony Ax100 and it was also amazing.

The AX100 had built in ND - absolutely needed.

The GH4 was better - results and build, more versatile, but slower working - and no built in ND. Bought the GH4 and have been doing commercials and documentaries. 4K on the GH4 works for me and makes 1080P look like SD.

Once my 4K TV arrives, I'll have better picture at home than what is delivered by most theaters in the USA. And, at home, popcorn costs less and if the cell phone rings - think cash register - I can, or not, pause the 4K and take care of business.

4K, affordable 4K, changes everything. It will not be film making leaving LA so much as film making arriving everywhere.

Getting eyeballs to content, that's another story in the making.

Frank A Rybicki

Jim Billington

Bio:

I started as a kid 50yrs ago with 8mm movies and photography, got a grant in 1970 while in High School to make a Super 8 documentary on Roku pottery. In the 70's I got a Beaulieu Super 8 considered the Cadillac of Super 8 cameras. In the mid-90s was making safety and training films with my job as training coordinator of the west coasts largest private shipyard. I am retired from shipyards and make HD film mostly of artists and performers and sailors. I am a smitten, commuted amateur who is as excited today as I was fifty yrs ago. I live on the beautiful Olympic Peninsula.

Contribution:

I would upgrade to 4k in a heart beat:

- Be able to crop video without noise
- Use video stills for photography
- if 1080p looks better as a result of rendering from 4k so much the better.
- Bragging rights, I have 4k and you don't.

Reasons not to upgrade:

Cost of memory and external recorder etc to capture video. For example the cost using Sony A7s is about \$1k for add ons just to function, this is prohibitive to me, yet pani has a fixed lens camera for under \$1k total that might work for me.

the complications in using Sony Vegas Pro which at this time doesn't accept Apple Pro res natively, bottom line, I can't just upload and edit. I do not see using proxy files as a big deal

crop factor

be able to use my manual prime nikkor lenses with adapter

Conclusion: I am almost ready to pull the credit card on 4k, but not quite yet. I have no compelling reason to buy into 4k when no one will watch it in 4k. I am excited about 4k capture and 1080p output. I am not going to give up my NLE of

choice Sony Vegas Pro and I am not going to give up my Nikkor manual prime lenses and crop factor is currently a pain in the ass and I am not going for worse crop factor (makes most of my lenses useless for the work I do indoors).

My budget to go operational is \$2k. So that would include any metabones adapter or external recorder. Using a cineform codec is not a big deal for me. So almost there, but not quite, am sitting this one out for now, but who knows what the next year may bring and maybe I will be able to find a screaming deal on a refurb. I bet Canon 5d mk3 will be dropping in price considerably in the next couple of years as people move to newer cameras.

Exciting to think about, but am sitting on the sidelines.

Jim Billington

Augusto Alves da Silva

Bio:

Polycordfilmworks works in several areas reaching from aerial filming for motion pictures and commercials to equipment rentals and consultancy. We do the R&D for the Squirrel gimbals which are widely used in handheld and multirotor setups

polycordfilmworks.com

Contribution:

On a daily basis I try to analyze exactly what I will be shooting and then decide.

In our arsenal we have several 4k cameras starting with the RED Epic which to be honest only gets one job out of twenty. Why? Very complicated workflow and most clients want either a quick turnaround and a lower price for their production.

Bearing in mind the clients needs (which by the way is always the next best thing and now it is 4k) we decided to get cheaper cameras which work amazingly well. First we started with the BMPC and now the GH4.

I love the GH4 since I have pioneered the GH1 and followed through to GH4. Up until today I always filmed with the GH4 in 4k. Why? Why not? It is a light codec and after transcoded to Prores it works perfect letting me reframe the shots and even when I rescale it to a 1080p timeline the increase in resolution is absolutely amazing.

The BMPC has a problem with its "low" 800 ISO but still has its purpose and usability. The only thing that bothers me with the GH4 it's not even the crop factor but the noisy sensor in low light. But what the hell...there aren't perfect cameras.

So we bought the A7s and we have the low light covered. Soon the 4k Atomos Shogun will solve that problem recording the A7s 4k externally if Convergent Design Odyssey Q7 doesn't get there sooner.

I have always been a fan of small cameras and small film crews. I shot 4 movies which were shown on National TV with a GH2 one and a half years ago and they

were a success not only due to the scripts and actors but also by the look of it without anyone knowing which camera we used to shoot them.

Most of our clients demand 4k not because they really understand what it means but mainly due to 4k being the new kid on the block. A RAW 4K image is so huge that most low to mid budget computer systems will not be able to deal with it...making it very difficult to work with not to mention space taken by the files, post-processing and even realtime playback of the 4k images.

The wheels are in motion and we can't do anything but to keep up with the evolution unless we have a "niche" market where we can dictate our own rules.

Augusto Alves da Silva

Steve Lampen

Bio:

Multimedia Technology Manager/Product Line Manager -Entertainment Products, Belden

www.belden.com/blog

Contribution:

THE CABLE SIDE OF 4K.

Part of the problem here is that there are many different kinds of 4K.

There are highly compressed versions which might end up as delivery to the home, and there are 6 GHz and 12 GHz versions being developed for professional users.

In the 12 GHz arena, there are two types, UHD (Ultra High Definition) with a resolution of 3840x2160 and a clock of 10.6921 GHz. This is aimed at the format for eventual home delivery, the "television" version.

The other format is 4096x2160 resolution and is most commonly used by Hollywood for motion picture production. The clock here is 11.88 GHz, so to say a "12 GHz coax" as is mention below, this cable would cover all these formats.

These formats can be carried by dual link cable (such as Belden 1694D) or quad-link cables, bundles of four coaxes, such as Belden 7788A, 7796A or 7711A, which are bundles of four common digital coax cables. Clearly, if you had a device with two or four outputs or inputs, these would be your cables of choice. Single link is a bit different.

While there is as yet no SMPTE industry standard for 4K, work is proceeding on designing and developing 4K single link coax. There is no doubt this cable will be distance-limited compared to HD or 3G cables. The safe distance for a 4K RG-6 version will probably be around 70 meters (230 ft.) and the digital cliff

approximately double that distance. If that is not far enough, you could use larger coaxes (Belden has two sizes larger than RG-6 and is considering even larger cables than that.)

Of course, the alternative is fiber. While the fiber itself will be about the same cost as the coax, the drivers and receivers, especially at the outset of 4K, will be a major expense, and the pressure therefore to use coax will be considerable. Reclocking and EQ'ing 4K on coax will be one option for longer distance but again will not be cheap. And none of this will be "for sure" until a standard is ratified, hopefully soon (but surely before the end of the year).

Some "early adopters" of single link 4K have been using existing cables such as 1694A. Belden has looked at the performance of their cables out to 12 GHz and believe we can significantly improve cable performance. These existing cables were not designed, and never intended, for 12 GHz applications.

The fact that some chip manufacturers have used existing cables at 12 GHz speaks to the improvement in chip designs and the ability of DSP to overcome nonlinearities or other high frequency losses. Still, Belden does not suggest the use of existing cables to 12 GHz at this point.

Steve Lampen

Hans Hansen

Bio:

Creative, passionate and dynamic, self made professional with a broad-based transferable skill set in filmmaking and postproduction. Extensive experience in audiovisual production as Director of Photography, Operator, Director, Editor and Post Production Supervisor for cinematography and web video. Earned a reputation as a high-energy leader willing to take on challenges others passed by. Consistently exceeds targets using innovative filmmaking technology with a key focus on customer needs.

List of jobs related to my last work:

Cinematography, documentary "Bucharest, memory lost" Goya Award 2009. Best Documentary Feature. Academy of Motion Picture Arts and Sciences. Gaudí Prize 2009. Best Documentary Feature. Academy of Catalan Cinema plus 7 more awards. "Gabor"/ "La Reve du l'eau", Albert Sole, "Castells", Gereon Wetzel, Documentary Film Award of the Bavarian Broadcasting Corporation. Short-film "You and me" Rafa Russo, nominated shortfilm, Seminci Valladolid 2013, 3 Awards. Cinematographer, Editor & Post production, documentary "The Final Escape" Silver Biznaga. Audience Award. Spanish Film Festival of Malaga, 2011. Silver Biznaga. Documentary section. Spanish Film Festival of Malaga, 2011. Special Jury Mention. International Film Festival 2011 in Guadalajara, Mexico. Honorable Mention. Remembrance iberoamericano documentary, Mexico 2011. Official Selection. SEMINCI 2011/Spanish Film Festival Nantes 2011/Documentary section. Mediterranean Film Festival Montpellier 2011. Cinematographer, Editor & Post production "Metropolita" TMB, Barcelona. "Right Now" Sanofi, Spain, Award Ciudadanos 2013. Director, Cinematographer, Editor & Post production "Mapping Casa Battlo", "Montserrat" DVD Releases, Triangle Postals. Several DVD's for German American Low German Conferences, Germany & USA; Promotional Videos, Montana Colors, Ecosystem, CDA, Kim Arnal, Caixa Forum; Over 20 "Making of's" for Spots & Commercials, 9 Video-clips. Color Grading for 3 cinema releases. Cinematographer "Intercanvi" Golden Gate Award, 10th San Francisco International Ocean Film Festival. Cinematographer "Frozen Memories"

hanshansen.es

Contribution:

The GH4 took me over by storm.

The results had been very gratifying so far. And the amount of data and post production are similar to the 5D but everything looks sharper and the shooting is so much easier.

Start with the amount of weight to carry around. On a recent shoot for a documentary in Shelbourne Falls MA. I just had the camera with a sling hooked to my wrist. The Panasonic intelligent shotgun mic with reasonable quality in the hot-shoe of the GH4. Another lens in my right jeans pocket, that's it. It reminds me on having a "normal" handheld camera like a couple of years ago, but with a huge quality jump. The good thing, I could go handheld with the 35-100mm Panasonic stabilized lens, You try that with the 70-200 equivalent and the 5D Mark III. You will be tired so much earlier and its nearly impossible to hold the full 200mm without a lot of shaking. I avoid doing that, the rolling shutter makes it unwatchable.

When shooting the 5D Mark III, I use the Tamron 24-70mm stabilized lens which allows me to go handheld. For documentary work its so much faster and flexible to be able to do handheld shots, there is no comparison. Things happen, you better shoot them right away. Everything staged is not the same. If you loose time with your gear, you might have lost the opportunity of getting the real thing. This attitude gave me almost every time the good emotional "real" situations which makes a documentary come alive. Key sequences in a documentary have to be captured fresh and as they evolve. Everything else just loses a lot of energy and becomes slightly unreal and awkward.

4K is not necessary right now, but as an early adopter I trust my intuition and so far I am shooting UHD all the time. The footage will hold up for future editing. There is no doubt it will be 4K as the next standard. It ads more sharpness and detail and gives me the option to re-frame and stabilize footage in post.

Why should I not use this opportunity?

Especially for documentary's its very convenient to have focus, a sharp shot can be blurred out in post if I really need it. With ND filters and the right distance to the subject the out of focus background can be achieved easily. But you will not get the same bokeh and full frame sensors look more "cinematic". Doing fiction it would be

a different matter. Already when you do fiction you have such an amount of expenses, you will not spare an extra dime on the camera department. That does not make sense.

4K is here to stay and it will be 8K soon enough.

When looking at 8K on a huge screen at IBC 2 years ago, I was overwhelmed by the detail in front of my eyes. But I was totally lost on where to look at. Everything was sharp and I did not know where to look at. This not something someone looks for as a storyteller. You want to guide and control the viewer where and when to look at.

Do not underestimate the process that's happening after the shoot is over. I have to shoot for post not for immediate delivery. Picture has to look flat so I do not lose information in the highlights and low-lights. The shot has to be in focus. Framing is utmost important but better a little loose then too tight, because I can re-frame in post. I need the real emotion and the real moment to make it look fresh and "real". Keeping that in mind I want all the resolution I can get and I want to be ready at all times, there is no 2nd chance in documentary's. And even when doing fiction, you better get it the first time. My experience tells me that 80 percent of the times the first take is the one, so better be prepared and have everything captured right from the technical standpoint the first time, there will be no 2nd first take. Actors loose tension after the first take, the whole crew kind of loses tension after the first take. Observe for yourself.

Just try to do some editing. As an editor I learned so much which is valuable when shooting, I would recommend it to any operator. Shooting is not enough. First rule for editing, ignore everything you consider the most beautiful shots. Its about the story, not about your incredible camera work. Shoot for the story, not for your ego.

P.S.:

Thank you very much Mitch, you are doing a great job! I had a lot of benefits from your articles so far. Its awesome to get good information for "free". It enables people like me to do great things even when they are not in perfect conditions to do

so, like me, as being born as a poor farmers son. The real revolution is the possibility to give people a voice that did not have a chance to speak out for a broader audience only a couple of years ago. This is real democracy, power to the people!

hug,

Hans

Herbert Jay Dunmore

Bio:

Herbert "Jay" Dunmore is the television operations manager at GreyComm Studios / WLOY-TV at Loyola University Maryland. As a videographer and video editor since the late 90's, his passion has carried him through entertainment, government and commercial video production. As an educator, he has taught digital media and media theory on various levels from public school and University, to government and private sector. In his training classes, he has the unique ability to bridge the gap between the beginner and the seasoned professional to ensure that all students gain a thorough understanding of software, hardware and lessons taught.

Contribution:

We've reached the season of summer, my favorite time of year. During this time, I love to vacation and pursue my passion of photography. This summer is unique because its also my first summer that I will be recording motion picture in Ultra High Definition (UHD)/4K.

As most of you may already know, 4K is the "buzzterm" and new television display standard that is being implemented in the broadcast and independent film world. For those of you that aren't yet familiar with 4K, in a nutshell, 4K is 4096 x 2160 pixels, or four times the resolution/picture quality that you will find on your current HDTV screen. There are other technical factors that play a part in resolution, so don't go thinking that your current HD equipment will need to be replaced soon. We've encountered this same transition to new technology first with the implementation of digital video in the late 90s, followed by the transition to high definition in the early millennium.

In the present day, close to 70 percent of people have high definition televisions in their households. It will be another eight to ten years before we begin to see 4K embraced on a larger consumer/home viewer level. It is anticipated that by the year 2025, 4K will be embraced and utilized in around 40 percent of homes for viewing on the broadcast level. In the realm of over-the-top and on-demand content, Netflix requires all submission in 4K resolution. Cable providers are pursuing the path to providing on demand 4K programming at an accelerated pace as well.

As a lover of technology in all things broadcast and engineering, I embraced 4K and have implemented it in some productions. As an adviser and educator, I relish the opportunity to provide this learning experience to our future broadcasters at colleges and universities. I realize that many schools and technology specialists are researching the technology and transition as well.

Here are a few questions and discussions that I have received and/or have come up in conversation with fellow educators, aficionados and practitioners:

1. 4K is not a broadcast format.

The resolution has been accepted as a standard, but is not broadcast over the air as of yet. The likelihood of your video being broadcast on traditional or satellite broadcast will not be taking place for at least another five to eight years. It is however a great for archiving interviews and beauty shots in a picture quality that will have compatibility with future resolutions and variations of 4K.

2. 4K video files take up more space.

In some cases, it will require up to four times the storage requirement to store video. On another hand, much of the video will be compressed, made smaller in size in order to play smoothly on the internet and mobile devices. When working with high-end and high-bitrate broadcast video, quality will definitely require more storage space. In the majority of cases on your lower-end resolution cameras and smartphone cameras, you can get away with video that produces a 4k image but with mediocre quality.

Heres a good link to an iOS app by AJA that gives a good idea of video file sizes:

<https://itunes.apple.com/us/app/ajadatacalc/id343454572?mt=8&uo=4&at=1l3v2PP>

3. 4K will require faster computers and connection

I won't dive into the world of computing here, but will say this. Your Firewire and USB are nice, but will slowly begin to show its age when you're doing multi-camera editing, animation and video conversion of your 4K event footage. Use of newer transfer mediums such as USB 3.0 and Thunderbolt multiplies data transfer speeds by 10. This makes for smoother video playback and allows room future

additions that will further increase flexibility in production.

4. What size screen will be optimal for HD viewing?

Just as a 42 inch screen or better is needed to truly appreciate the resolution and picture quality of 1080p video, you would need to have at least a 55 inch television screen to begin to appreciate the resolution of the image. At smaller screen sizes, manufactures will have a hard time fitting all of those pixels in such a way that the image will provide a sharper image than traditional HD.

As we transition into this 4K and the workflow /best practices associated with the technology, it will be an exciting time. I am looking forward to the Seattle 2014 conference, where topics such as 4K and other TV broadcast related technology and tips will be covered. This year's conference is poised to be one of the best and most exciting yet.

4K Cameras:

Blackmagic 4K camera

AJA Scion

Canon C500

Panasonic Lumix GH4

Sony PZ100

Herbert Jay Dunmore

Michael Artsis

Bio:

Michael is a pioneer of the internet and TV and he is a visionary. He was the first person to broadcast live event coverage to a NY newspaper home page. He was also the first to do a lot of things with video online. Michael has been in the TV news, journalism and tech field for more then a decade and a half. He currently does a lot of on air work with GeekBeat.tv, BeTerrific.com (a company he co founded and co owns that does positive live and original content online) and Adorama (he is a Technologist and on air talent for them) in the technology space. Michael has also created countless behind the scenes stories. Michael has 5 Emmy Awards and 15 national TV and radio awards to show for his work as a journalist, but his experience has taken him far beyond the camera. In 2006, Michael created an online video company called PressPassTV which garnered more than 22 million viewers under his direction. He has worked at every level of the business from radio and TV to the internet and even print. He has worked for Newscorp, NY Post, The Daily, NBC, NY 1 News, CNN, WLNY, WGBB, WLIE, TWC, Channel 10 and countless others. He has also spearheaded advertising and marketing campaigns that have helped companies grow or revitalize their businesses and become major players in their spaces. From on air talent and host to engineer to cameraperson, executive, teacher to and management, Michael has made an impact and does it all. Michael also created a digital marketing, video production, and photography company called ArtsIsMedia that has several high end clients including Sprint, The NFL Alumni Association, Subway, Burberry and FTI consulting. He has produced and directed national TV commercials documentaries and more.

beterrific.com

Contribution:

This will be remembered as the year of 4K's real arrival where everyone can shoot

4K and should at least consider it. Sure, 4K presents challenges, but it's more affordable then ever thanks to a ton of great gear and some announcements, like the Sony A7s and the Atomos Shogon 4K Recorder monitor. Both work great when paired. AJA and Black Magic Design led the way with new camera announcements. AJA with their first ever camera and BMD adding 3 new cams. There is so much

hope and potential. Another highlight is the new amazing lens from Canon with Electric zoom servo for the Cinema line.

<http://www.adorama.com/CAE17120PL.html>

<http://www.adorama.com/CAE17120PL.html> with PL and EF mounting options.

I am very excited to be bringing you knowledge, tips, advice, workflows, buying guides and more for 4K. We are going to kick this off with the technology that is certainly coming of age this year and is all the rage right now. 4K video, UltraHD (UHD) or DCI HD. I will explain all this later. This is the year of 4K. With 4K TVs and displays becoming very inexpensive and services like Netflix streaming in 4K, your clients are most likely already asking for it. If not, they will be shortly. 4K can be confusing, but I am going to make it understandable. Do you really need it? Good question. Answer is yes! and no! clients will ask for it and you will want to shoot it for many reasons including making your productions the best. No because of the infrastructure and work flow commitment and because 6K is here in some form and 8K is around the corner. What scares and sobers me is that we are in a tech arms race. Buying 4K gear seems like a waste, unless your buying gear anyway and if you go with the lower end stuff. Maybe its better to rent the higher end stuff, because its a race to the bottom with production budgets, which is awful. But what scares me is keeping the infrastructure up as we move to the next thing and the next thing- there is no way to future proof. There are a ton of options. SO go with what makes the most sense for each situation and and job and make the most you can. Remember that all cameras are good enough now and that it's really the craftsman not the tools. Remmeber that the audience can't really tell the difference, especially when the delivery method for 4K in most cases isn't there. The clients might be savvy and the viewers maybe too. But it doesn't mean that not having 4K will negatively effect the production or that they will notice or care. So choose whats right for you and the job. We are all doing this for the art but also for a check so keep that in mind and check yourself before you wreck yourself. Its easy to get carried away. The thing that excites me most with 4K is that it looks amazing and it also offers a ton of flexibility and can offer great dynamic range. I recently shot 4K video on an iPhone 5S with a special anamorphic lens and a beta version of an app that allowed me to shoot and edit raw 4K video on the phone. Its amazing. Its the future and the footage looked

unbelievably good. We screened it on a 4K samsung 78" curved UHD screen and it was unreal. The best part- the detail in the shadows and the dynamic range. the real best part- shot and edited on a \$1,000.00 iPhone. Thats amazing! So now get excited... Get Very excited.

Let's start with the gear, which really starts with understanding the workflow. The first thing is whether you edit on a PC or a Mac (I'm a Mac) you will most likely need not only a new computer but a new infrastructure. The way my production facility is set up now is we have a Small Tree Titanium combined server/storage array (love it) feeding about 7 editing computers. Now I know a lot of you don't get servers and set up things this way because it's expensive but it's really the best way and I am nearly positive that with 4K you won't be able to daisy chain drives or handle the massive storage needed on individual drives or computers. So this will be the only way to go. I love Small Tree. They came in like knights on white horses and saved the day in the middle of an edit for a major client when another system had failed. That was years ago and I have never had a problem with any of their systems, plus customer service is tremendous and fast. We have had 2 systems and recommended countless others. All with no issues (knock on wood). I love them (it's well documented) so I recommend them and continue to use them. But no matter what you use, you need a server with raid redundancy and super fast drives that can handle the stress and load, and probably one that can handle thunderbolt or fiber, fiber being the best way to go if your computers can handle it.

Getting back to the computer, I would recommend a Mac Pro that is loaded to the gills. We ordered ours and are waiting for it. You can talk to John in the Mac dept of Adorama or any of the Mac guys at Adorama and order yours. If you choose to go PC get a terrific one with great graphics cards. If you are building one it is wise to start with one that was intended for gaming. This machine needs to be powerful. We did a 6 core, dual gpu, 3.5ghz machine, best graphics cards, and tons of ram (tons of ram is a technical term that means 32GB, lol). For a PC I recommend the same kind of setup. Basically, go to the apple site and emulate what they offer. You might save a buck but I still vote for Mac and I say don't be pound wise and penny foolish. So you probably think all you have to do now is buy the camera, right? Not so fast. This is a serious investment and you have to be ready for it. That's why I am laying it out. Ultimately I think it's worth it for you, your business and your clients, and I believe you will be able to make it work well for you and boost business. But you have to

know what you are in for. 4K should help counter act the slashed prices and industry killing free productions thanks to YouTube, viral video and DSLRs. It should separate the real creatives like you from the pretenders. So this is exciting and good!

The next step is to get monitors. Dell has good reasonable monitors that display in 4K, Seiki offers the cheapest but a lot of people question the quality. I can tell you that the quality isn't there on these monitors. But they can get you going if you need to be budget conscious. There are also a lot of other brands available. Another option is that you certainly could just buy a Samsung 4K which would be my first choice because you can go in HDMI and they look amazing. They are reasonable and look terrific.

Now that you have the final infrastructure (don't forget battery backups, and setting this up in a safe place off of the floor) lets discuss work flow then cameras and accessories. No matter what camera you buy, the final infrastructure and work flow should be pretty similar. Even with the inexpensive 4K cameras you will need to support them with a robust infrastructure and work flow. You will most likely be shooting some flavor of 4K raw video no matter what camera you choose with the exception of the Canon 1DC which only shoots motion JPEG and UHD (more on UHD later). Some cameras like the BlackMagic 4K record 4K on board in the camera, some do not at this point. The impending Panasonic GH4 shoots compressed Ultra AVCHD on board which is a compressed 4K. I haven't seen the camera in person or used it yet, but I think even with this camera you will want to record to an external recorder because you won't want compressed video if you can avoid it. Also, I never liked AVCHD so I doubt to have a love affair with Ultra AVCHD.

So your work flow will most likely be one where you shoot onto an external recording device like an AJA Ki Pro or an Odyssey Q7 from Convergent Design. There are other options but these two are the favorites right now. Personally I love the Q7. It is not only a recorder but also a monitor and it offers a slew of great and needed features like focus peaking and false color. In this space it's reasonably priced (though please note that you have to buy a license after purchase of the device to open up the ability to record 4K). So now you have shot some flavor of 4K raw video and you have a ton of SSD drives that it's stored on. (Raw video takes a still image, raw photograph, for every frame. So you are really shooting high quality images

which is great! You can grab one and use it for billboards or ads or whatever. It's that high quality. A lot of guys are doing that and have been for years with Red Epic cameras, which now shoot 6K).

You will transfer it to your server and stick the SSDs in a Pelican for safe storage as a backup to the backup your server makes (don't erase the SSDs until the project is over). Now you will either make an HD proxy of the footage to edit a little more easily or you can edit in 4K. It will depend on your system and your desired workflow. Personally, it adds steps but I would go into /Davinci Resolve and make the proxies. You are most likely starting your workflow in Davinci because of 2 reasons. You shot flat, with little color, so you could get the most detail, dynamic range and the exact look you want out of the video in post, and so you can paint the colors in with color correction during post. The second reason is so that you can add LUTs and make proxies. LUTs are basically color correction templates - you can select pre made ones or create your own. They are pretty standard and the idea is that they give the video some color and feel so the client, directors and producers can see rough cuts and don't have to stretch their imaginations too far. Because we all know they can't. But you don't have to do a full color correction before they make changes which could eliminate a lot of work completed or add to the amount of work. LUTs can also be used if you are delivering the video to broadcast TV and they are demanding it be in the REC 709 space. But then you probably just ruined fabulous video because that standard looks terrible - come on broadcast - get with the program. You start with Davinci, add your LUTS and send the video proxies to Adobe Creative Cloud/Premier to edit. Lets face it, as much as I love FCP Studio and FCP X I know you're not using it. AVID is way behind the curve and Smoke is way too expensive and fringe. So you are using the new industry standard, Premier. You do your proxy edit in Premier. Get client approval and send it back to Davinci where you reconnect it to the 4K media, take off the LUTs, color correct and export the final project. You then bring it back into Premier for final graphics and export again. Of course at some point in the process you did all your audio work.

Now to deliver. You make a full HD version, a web version and you export the full 4K version. Right now 4K will not be able to be broadcast over the air to TV or to cable customers so it is perfect for displays that are in lobby's, trade show booths, and streaming to Netflix or youtube or other web streaming platforms. The users must have a lot of bandwidth to watch and the right hardware or it won't work.

Shooting in 4K does future proof your content to some extent and is great for archival purposes, but it's not for every job. However 4K footage down converted to HD looks amazing. Now you understand why the gear has to be so robust - it's the file sizes, the resolution and this workflow. It's all about data speeds. 4K needs a lot of speed and big open pipes. This is the case with any of the 4K cameras.

Before we discuss cameras, let's talk about the flavors of 4K. 4K comes in two flavors right now. Full 4K, Digital Cinema Initiatives Compliant HD or DCI HD, (4096x2160 pixels) and UHD or Ultra HD (3840x2160 pixels). UHD is considered the standard broadcasters and cable companies will adapt. It's also exactly double current full HD or Super HD specs (1920x1080). DCI HD is reserved for movies and higher end projects. It's similar to the 720p vs 1080p HD conversation. Remember FOX sports is still only broadcasting in 720p. Both resolutions look amazing and you can really crop into images and not lose image quality. This is a first for video. UHD seems like it will be a more affordable, more readily available, more common format. Which means I like DCI HD a little better, because it is better. Higher quality. Better resolution. If you are going to go - go all in! That's what I say. DCI will be what you watch in theaters. These are not official terms by the way - they are terms floated by a few manufacturers, consortiums, associations and broadcasters. My bet is that they will stick. I like them because they are simple to understand and I don't have to keep putting up the resolutions. Now that you have the final infrastructure (don't forget battery backups and setting this up in a safe place off of the floor), let's discuss workflow, cameras, and accessories. No matter what camera you buy, the final infrastructure and workflow should be fairly similar. Even with the inexpensive 4K cameras, you will need to support them with a robust infrastructure and workflow. You will most likely be shooting some codec that includes 4K RAW video (for best results) no matter what camera you choose, with the exception of the Canon 1DC which only shoots motion JPEG in UHD (more on UHD later).

Some cameras like the BlackMagic 4K record 4K on board in the camera. The Panasonic GH4 shoots compressed Ultra AVCHD on board, which is a compressed UHD 4K. I haven't seen the camera in person or used it yet, but I think even with this camera you will want to record to an external recorder because you won't want compressed video if you can avoid it. Also, I never liked AVCHD so I doubt I'll have a love affair with Ultra AVCHD. Your workflow will most likely be one where you shoot onto an external recording device, like an AJA Quad Ki Pro, an Odyssey Q7

from Convergent Design, or an Atomos Shogon (newly announced- at NAB). There are other options but these are the favorites right now. I am going to be shooting 120fps this week in full 4K on a Sony FS700 recoding into an Odyssey Q7. I can't wait. I am so excited. This is a huge breakthrough and a very reasonable setup. I am a firm believer that high speed shoot and over cranking is key to almost any production today and doing it on set instead of in post is important. Additionally the Q7 is supposed to make the FS700 which I don't love look amazing at 4K. I am sure there will be others that come along too. Personally, I love Atomos, so the Shogon will be a favorite for sure. I love how they keep improving. I also love the Q7. It's stunning and has great features. It is not only a recorder, but also a monitor and it offers a slew of great and needed features, like focus peaking and false color. In this space, it's reasonably priced (though please note that you have to buy a license after purchase of the device to open up the ability to record 4K). I just talked to convergent design and the folks there say a free firmware upgrade is coming that will allow all Odyssey Q7 users to record 4K ProRes 4444. This is great news. It means almost any 4K camera will work with the Q7, including the Panasonic GH4, which I am not sure I am in love with. But I do like the price. However I wouldn't buy the breakout box because it's clunky and heavy and not user friendly and when you add up all the costs associated with it, you might as well buy a great camera to start with because your nearly there. Expect this ProRes codec to become a standard.

Atomos introduced the amazing Shogon monitor, a 4K recorder for under\$2,000. It has got all the great features you'd expect from Atomos, including their great pricing. It's a big beautiful screen. It's durable and has features like waveform, vectorscope, focus assist, logging, and a ton of other features! It will shoot Cinema DNG raw, DXG, and Pro Res 4444, with more codecs promised. It also adds LUTs (look up tables) and it sports a touch screen. Atomos is usually my favorite and my monitor/recorder of choice in general. It will also record up to 120fps. I love that! I love high-speed footage. So, this excites me a lot. I can't wait to get my hands on it.

Assuming you have shot some flavor of 4K raw video at this point and have a ton of SSD drives, store it in RAW video (RAW video takes a still image, raw photograph, for every frame.) This means you are really shooting high quality images, which is great! You can grab one and use it for billboards, ads, or whatever. It's that high quality. A lot of guys are doing that and have been for years with Red Epic cameras (which now shoot 6K). You will then transfer it to your server and stick

the SSDs in a Pelican airtight case for safe storage as a backup to the backup your server makes (don't erase the SSDs until the project is over). We use the Small Tree servers and the titanium isour server of choice. They are great. They are a server and storage array in one and they are true workhorses with practically zero downtime. We rely on them and don't worry about storage or editing. You can have up to 10 users at a time editing the same or different projects with no slow ups. Truly, great products. Small-tree.com <https://vimeo.com/91488098>

Now, you will either make an HD proxy (low resolution version for easier editing - less load on the computer) of the footage in order to edit a little more easily or you can edit in 4K. It will depend on your system and your desired workflow. Personally, it adds steps, but I would go into Davinci Resolve and make the proxies. You are most likely starting your workflow in Davinci because of two reasons. You probably shot flat - with little color, so you could get the most detail, dynamic range, and the exact look you want out of the video in post, and so you can paint the colors in with color correction during post. The second reason is so that you can add LUTs and make proxies.

LUTs are essentially color correction templates - you can select pre-made ones or create your own. They are pretty standard and the idea is that they give the video some color and feel, so the client, directors, and producers can see rough cuts and don't have to stretch their imaginations too far. But, you don't have to do a full color correction before they make changes, which could eliminate a lot of completed work or add to the amount of work. LUTs can also be used if you are delivering the video to broadcast TV and they are demanding it be in the REC 709 space. But, then you probably just ruined fabulous video because that standard looks terrible; Come on broadcast, get with the program! You start with Davinci, add your LUTS and send the video proxies to Adobe Creative Cloud/Premier to edit. Lets face it; As much as I love FCP Studio and FCP X, I know you're not using it. AVID is way behind the curve and Smoke is way too expensive and fringe. So, you are probably using the new "industry standard" Premier. You do your proxy edit in Premier. After client approval, you send it back to Davinci, where you reconnect it to the 4K media, take off the LUTs, color correct, and export the final project. You then bring it back into Premier for final graphics and export again.

Of course, at some point in the process you did all of your audio work.

Now, to deliver: You make a full HD version, a web version, and you export the full 4K version. Right now 4K will not be able to be broadcast over the air to TV or to cable customers so it is perfect for displays that are in lobbies, tradeshow booths, streaming to Netflix, and YouTube or other web streaming platforms. The users must have a lot of bandwidth to watch and the right hardware or it won't work. Shooting in 4K does future proof your content to some extent and is great for archival purposes, but it's not for every job. However, 4K footage down converted to HD looks amazing. Now you understand why the gear has to be so robust - it's the file sizes, the resolution, and this workflow. It's all about data speeds. 4K needs a lot of speed and big open pipes. This is the case with any of the 4K cameras. Figuring out your workflow is important. It should give you an idea of the time you need to spend on a project. Parts of your workflow can be flexible and can even change from project to project. Other parts should not change. The key is finding a basic workflow you are comfortable with and building from that. Then, just become more efficient at it. However, no matter what your workflow is, it is important to figure it out before you shoot.

Now we are nearly ready to discuss cameras. However, before we discuss 4K cameras, let's talk about the flavors of 4K. 4K comes in two flavors right now: Full 4K - Digital Cinema Initiatives Compliant HD, also known as DCI HD, (4096x2160 pixels) and UHD also known as Ultra HD (3840x2160 pixels). UHD is considered the standard broadcasters and cable companies will adapt. DCI HD is reserved for movies and higher end projects. It's similar to the 720p vs 1080p HD conversation. Remember, FOX Sports is still only broadcasting in 720p. Both resolutions look amazing and you can really crop into images and not lose image quality. This is a first for video. UHD seems like it will be a more affordable, more readily available, and more common format. Therefore, I like DCI HD a little better, because, it is better. Higher quality. Better resolution. If you are going to go - go all in! DCI will be what you watch in theaters. These are not official terms by the way - they are terms floated by a few manufacturers, consortiums, associations, and broadcasters. My bet is that they will stick. I like them because they are simple to understand and I don't have to keep putting up the resolutions.

Camera wise, here is how it lays out:

New - Announced at NAB

Black Magic Design URSA - This camera is the most innovative. First of all, the price is very affordable - under \$7,000. Second, the workflow while shooting is extremely interesting. The camera has 3 workstations; one for the DP, one for the sound tech, and one for a producer. The URSA sports a 10-inch LCD and two smaller ones at the other positions (battery drain might be an issue here). You can also use the camera as a solo operator too. It's bigger than a DSLR, but smaller than a traditional ENG camera. It is built to compete with other cinematography cameras and looks closest to the Sony F series. The URSA comes in several options. One of the options allows you to swap sensors easily. It has XLR audio and a ton of great features. The URSA is supposed to be shipping in the fall. The camera has a 35mm sized sensor, according to BMD. The URSA will have a PL lens mount.

Black Magic Design Studio Cam 4K - At NAB BMD introduced two innovative Studio Cameras; One that shoots HD and the other that does HD or 4K live. Both sport 10" screens and look like an iPad with a lens mount. The Studio cams can be color corrected and shoot flat in the cinema profile and under saturated in the video profile. They pair well with the ATEM BMD switchers. The Studio cams offer the ability to view LUTs and also have focus peaking and other interesting features, which include: fiber optic communications with built in walkie-talkie functions, tally lights, and more. The screen has a sunshade too. Sensor size is supposed to be the same as the pocket camera (in the HD model) and the production 4K in the 4K model. The lens mount is micro 4/3s but with a PL adapter it can take many lenses. The HD studio cam is shipping now, though firmware updates for LUTs and color correction will come later for the cam and Switchers. The Studio 4K will ship by the end of the year, allegedly.

All of the Black Magic cameras announced at NAB seem awesome and will change the way we think, work, and shoot! I like that idea. I like everything they offer and I am very excited about these, conceptually.

AJA Cion - This is the single most exciting announcement from NAB, in my opinion. AJA has always been a great company. Their products have always been top notch and they always have been a company that makes products I use and trust. Their AJA recorders, including the AJA Quad Ki Pro, are awesome and robust. They

offer great options and flexibility, and like most AJA products, are flexible, durable, and reliable. At NAB, AJA announced their first camera; A 4K camera that will shoot UHD onboard and DCI 4K to an AJA external recording device, like a Quad KI Pro through an output. The camera is amazing in fit and finish, and sports a 35mm sensor, suede shoulder mount. It is also great in size, shape, and weight. The Cion will record to AJA SSD drives. The drives are the same ones AJA makes for their recorders like the Quad Ki Pro. The Cion has XLR audio inputs. The camera is laid out well and well thought out, feature wise. The mount is a PL mount and the camera is under \$10,000. This is very exciting. I can't wait to get my hands on one. I think this camera will be stunning and a game changer. Look for this camera to ship by fall.

Sony A7s - Could this be Sony's big comeback? This camera is a beast. It's stunning and it has a ton of great features. It's comfortable in the hand is small and can go unto about 40,000 ISO with very little grain and a lot of detail. It will go unto nearly 500,000 ISO. This is a mirror-less camera that is tiny. It feels and looks smaller than the GH4. It boasts a mirror-less Full Frame Sensor and looks like a baby DSLR. On board, it shoots 1920x1080. Plug in a 4K recorder via HDMI, like the Atomos Shogon (which it was showcased with at NAB), the Convergent Design Odessey Q7, or the AJA Quad Ki Pro and this camera is a 4K beast, recording uncompressed 4K that looks stunning. The camera takes Sony A mount lenses and with adaptors it can handle just about anything. This may have been one of the most impressive announcements at NAB and with its sub \$2,500 price tag, even adding \$2,000 for a Shogon, makes this the most reasonable solution for uncompressed 4K. This camera is very exciting and there is no doubt that I can't wait to shoot with it! It ships soon and will most likely be hard to get, as I am sure it will sell out everywhere. It has a ton of great features including a 1/8 microphone and headphone jacks. It's been a while since Sony has impressed me, but they did it. I was skeptical, but no more. It could be a huge hit for Sony and I think it's definitely a great step in the right direction. It shows Sony gets it and is trying to appeal to filmmakers. This is definitely a great B camera and a compliment to any more robust 4K camera. But, in many cases, this can be the main camera. It also will work well in a live, multi cam workflow.

Panasonic - HX - A 500 4K Wearable Camera

Panasonic - Panasonic Debuts 4K Camera/Recorder, VariCam 35, With New Super 35MM MOS Sensor, AVC-ULTRA Codecs For 4K

This camera will be the new VariCam flagship for Panasonic. It was showcased, along with a price announcement at NAB, reported at \$65,000, as Panasonic seemingly looks to compete with the Sony F 65. No bones about this - It's designed to be a true high-end cinema camera. Details on this camera are a little cloudy still, as it's not expected to ship before quarter 4. It will supposedly have a DCI 4K sensor, but record at UHD and record to AVC ultra on P2 cards. None of this sounds that stunning or mind numbing. Nothing that will change the way we think or innovate. The one thing that rubs people the wrong way is that while everyone seems to be dropping prices, including ARRI, Panasonic seems to be going the wrong way with price on this. It also doesn't seem to offer that much. But many people love VariCams and I would say this is completely a wait and see camera. Lets see what it is and how it is when debuts, before we pass judgment, especially given Panasonic's past track record with the GH4 and the VariCams legacy. But, at least you are aware of it. Some more details below from its pre NAB announcement.

Already on the Market prior to NAB.

Canon C500. The C500 is probably my favorite current 4K camera. It has a full frame sensor that crops to a large Super 35mm when shooting 4K. It has a lot of great features, including 10 bit or 12 bit recording and 4:4:4 color (the latter for HD creation, through uncompressed Canon MXF files) and XLR audio in, with good pre amps and low noise. It sounds good. It is capable of shooting REC709 for broadcast. You can buy it with a PL mount or a mount for Canon's great EF line. It has built in ND filters and several HDMI and SDI outputs. In my mind, the only drawback, and this is a big one, is that it won't record 4K in the camera. You need an external recorder like the Odessey Q7 (my recommendation) to record 4K, which you would record in Canon's version of raw called, C Log. I will say this though; the idea of having to use an external recorder drives me crazy. The camera has great ergonomics, a great feel, and I have to add weight and bulk to it. It reminds me of the days when I began my career with an Ikagami 340 Camera and a Sony 3/4" tape deck hanging from my shoulder, connected via cable. I had a lot of batteries to carry and none powered anything that long. It made life miserable. It seemed ridiculous then and still does. I feel like it limits the way you can shoot and what you can shoot.

Ultimately, in this case, it's not the end of the world and you can rig it into a nice little tight package that's all one piece. That being said, I truly hate the idea that the camera can't record 4K itself, especially at the price. You can however, record either full 1080p in the camera for high-end HD productions, 1080p proxies for dailies, or off-line editing on board in the C500. But, then you basically have a more expensive C300. I believe that this camera is tough, durable, and a workhorse. A firmware update fixes the fan issues so the fan stops when you start recording now. You have time code and gen lock to sync time code with other cameras and devices on board. Canon seems to be rolling out an amazing auto focus system, which is now offered as an upgrade to the C300. I expect this will become available in the near future for the C500. While I almost never use auto focus, I do think this will be worth it and be very valuable. Additionally, I really love the images off the Canon cameras, especially the DSLRs. They are only second to Nikon, RED's, and ARRI's (though 2 of these manufacturers don't offer 4k cameras). I think they look stunning and beautiful. The sensor looks great, but you won't get as shallow a depth of field shooting 4K as you would with the full frame 5D Mark III because the full frame is cropped to 35mm. The images you can turn out are stunning and it's priced very reasonably for a very high-end machine. It is currently Canon's flagship.

BlackMagic 4K. This camera is an affordable 4K camera on the market. There are real issues with it. It's also got a small sensor and overheats. Additionally, it doesn't have the best dynamic range. But if you consider that you get Davinci Resolve with it, which is a \$1,000 program (you probably need it with any of these cameras) and BlackMagic's Ultrascope, you are basically paying \$1,500 for the camera. But even at full price, it's amazingly affordable. The sensor is reportedly a 35mm sensor, though many seem to question that. I'm told by several reliable sources that it is a medical grade sensor, which doesn't have the best color space, but excels on detail. If that's true, it shouldn't matter because you will be painting in color later in post with Davinci Resolve anyway. You will most likely be shooting BlackMagic's Cinema DNG codec (due in firmware update shortly), which is their flavor of raw and is more flat than most. It will also shoot to Pro Res 4K MOV files, if you prefer. That's a lighter, easier codec. But, you will probably want to shoot Cinema DNG. The BlackMagic 4K will also shoot in REC709, if you'd like. The camera has 12 stops of dynamic range and has a Canon EF mount, so it takes Canon lenses. In a most unprecedented move for a digital camera, it has a global shutter that allows it to have no rolling shutter or jello effect and virtually no moiré. You lose a little low

light performance for this and add a little grain, but from what I have seen it's totally worth it and controllable in post, especially with Davinci. Fast moving objects, like racecars and trains, no longer look like they are leaning; neither does a building, if you pan fast. This is very important. More cameras will probably go this route in the future. You can actually see the blades of a fan or propeller instead of seeing that weird effect. It's awesome. Speaking about shutter, it has a cinematic shutter that works on angle, instead of split seconds, so you will have to learn that if you didn't go to film school and shoot film. But, it's not a big deal.

This is the exact same body as the BlackMagic Cinema camera. It has two 1/4" audio inputs, which are as much of a joke as the audio on the camera in general. No audio meters and no real ability to control audio (controls are deep in the menu and don't do much), couple that with poor quality pre amps and low impedance, and you will be recording dual audio with this camera and syncing it later in post, for sure. I am not a fan of the body, shape, or weight balance. But I will say this, considering the price and stunning image quality, and that this camera will record UHD 4K (not the full 4K) on board, with outputs for UHD via 6G SDI, giving you the ability to record into an external device or use it in a live workflow, it's well worth it. Buy a rig and make it more suitable or user friendly and deal with the rest.

It doesn't have genlock for time code locking with their camera or other devices. You do have focus peaking built in, and it's great! I think that's really important. False color would also be amazing, but nope. The LCD isn't the best and you will need to use the free sunshade you get with it, regularly. At the very least, buy a monitor; if not a monitor, an external recorder combo. The BlackMagic 4K only has a built in rechargeable battery (it's not removable or replaceable) that lasts just long enough to turn it on and plug it into external power or a 3rd party battery, which is a must. You record to SSD hard drives, which you can buy at any computer store, and were intended to spend life serving a computer. It's great. It keeps media cheap and easy, and works well. You can replace drives in a snap and find them for purchase virtually anywhere; great for all the long shoots in remote places. The BlackMagic 4K might be durable, but the Cinema Camera wasn't. So, treat it gently to be safe. These are a lot of expectations to put on the 3rd camera ever made by the company, and only in the past 2 years.

This camera proves what I always say - it's not all about stats. It's all about the

image quality. I don't care what the stats say. I care how it looks. I don't care if Derek Jeter hits one home run all season, as long as that one was when it was needed and that he shows up in the playoffs to hit another when it's needed. I believe in the intangibles and that's why I like this camera. I also love when a company does what everyone else is doing but for a lot less and then adds a cool new features and shocks the world. I guess I love the under dog, especially one that makes things affordable for me, so I can overachieve on a budget. That's what BlackMagic has done here. It's groundbreaking and a must have. It shoots beautifully and is offered at a great price. I will own one and you should too.

Sony FS700 - the best part about this camera is that it can shoot high-speed footage. Other than that, I don't love the form factor or the images that come out of it. It's a Sony product so I have some respect for it, especially since I used to exclusively use Sony. But, I am not sure that it's worth the price, especially with the additional money you need to spend to upgrade to 4K. (The 4K upgrade will be available soon.) You can team it with a Convergent Design Odessey Q7 monitor recorder for full 4K recording now. This might be the better route as I love the Q7 and its features and it supposedly makes an underwhelming camera look stunning. Also it allows you to over crank to 120fps at 4K. The camera has a Super 35mm sensor and SDI and HDMI outputs. This is good for the future. This is a video camera first, so you do get a ton of great video camera features and less work around. You get great on board audio with XLR inputs. You get ND filters. It's Sony's entry level 4K and it's worth considering. You know it will be a solid product with dependable image quality and build. So, while I don't love the camera, it is certainly worth a look.

Panasonic GH4. The GH4 is one of the most intriguing of the bunch. The GH2 was a great camera that was highly touted and hack-able to be even better (I don't hack cameras. I won't even think about it. I don't recommend it, but facts are facts, hacks happened and hacks made it better). Francis Ford Coppola publicly stated he would shoot his next feature film on the micro 4/3s GH2. With its small, cropped sensor it certainly packed quite the punch. It had one major drawback (some minor ones too) - when you hit record, it shifted the white balance to green. In daylight it was hardly noticeable, but inside it was unmistakable - no matter how much light you had, it appeared everywhere especially the shadows. When recording, it locked you out of changing the white balance and ISO, making it impossible to overcome.

The problem was you couldn't anticipate it or work with it. Any other camera I have ever used doesn't change when you hit record. The GH3 improved on this and many of the other issues. But its build quality was poor and the images didn't look amazing. It seemed like a step backwards. So to say I am skeptical of a 4K camera that will allegedly upscale the video to make it 4K and will have a low price and small sensor, is an understatement. But it has a lot of potential, especially with its additional, optional battery brick/breakout box.

The camera will shoot UltraAVCHD (compressed UltraHD) to SD cards on board in the UltraAVC HD codec, but with the breakout box you will be able to do amazing things: 6GSDI uncompressed output to an external recorder, HDMI out, XLR audio in with real audio meters. With the breakout box, the camera and its price tag promise to be amazing. Panasonic also has a long legacy of making great cameras. So this is definitely a camera worth considering and is expected to be under \$5,000 all in - maybe even under \$4,000 before you add the external recorder. The images we have seen so far have been great and beautiful, but no word on whether they were shot to an external recorder or on board. My guess is external recorder though breakout box. The breakout box is supposed to have gen lock for locking time code. I also want to know how durable it will be and how it will do with heat and cold. One thing I do know, the on board LCD screen will be terrific.

Sony PXW Z100 - We would be remiss not to add this camera to the conversation. It's different than the others, but still has a place at the table. Some features are impressive, while others are not with this camera. It's all about the trade offs and what you need.

It's probably the best run and gun reasonably priced 4K camera of the bunch (Sony has a slightly cheaper entry level version, but this one is significantly better and worth discussing). It shoots full 4K, not UHD. It's a descendent of the DSR PD 150, one of my favorite cameras of all time. Its direct predecessor is really the EX (or the HDR FX line) line up and it looks a lot like it too. The good - it's an all in one solution; Proper audio with XLR inputs and great pre amps for terrific sounding on board audio, ND filters built in, great battery life, SDI and HDMI outputs and a 20x zoom lens. The bad - it starts with a small sensor and poor low light performance. We aren't talking about darkness, we are talking sun setting a little. Also, I feel like it's a repackaging with a new sensor and 4K capabilities compressed to a proprietary

format, which can be taxing on the editing system and hard to work with (XDCam). There is nothing groundbreaking or special here. It's a safe and easy to use camera. It's a Sony. Anyone can pick it up and shoot it, literally (that's a good thing).

Sony hasn't been game changing in this segment in a long time (maybe since the PD 150). With the small sensor, there is no shallow depth of field or great control of the image, making this more like traditional video footage. Shooting at 50 or 60 frames (your only options) will make it more like video too. It's a video camera, not a digital cinema or production camera. It's certainly for everyday use. At first, the price seems good, and if you are doing news/ENG than this is a good camera that will have some shelf life. Quick down and dirty productions, like documentaries in hostile places, conditions where you really need to move fast and have the camera just work, power on, and record with no setup, true run and gun shooting; If these are what you are shooting, then this is probably a good choice. Otherwise, go with another option; especially because the price seems high for everything else.

One last note on the Z100: Firmware updates to make it better in low light and overall, as well as adding new features are promised. But, no word on timetable yet.

Panasonic 4K Vari Cam. For years, people have sworn by Panasonic Vari cams. They shoot high-end news programs, commercials, and even movies. Personally, I have never been sold on them. I think their price tags are high, the images are fine, and you can do better. However, Panasonic has announced a new 4K Vari Cam that I expect will be in the range of the Sony F65. No word on price or availability yet, but so far from what we are told, it is intriguing. We don't know enough to comment now and there isn't any video floating around that was shot on it, but I wanted to mention it so you would be aware that it is coming. NAB will probably shed more light on it and it will most likely be a favorite of news, TV networks, and reality programming. This camera will have all the goodies for sure. I wish Panasonic would get with the program or wave the white flag. I mean, while every one including Arri is dropping their prices- Panasonic puts this cam up at the ultra high end? Its not warranted and I am not a fan of that, especially not for a company struggling this much. They just don't get it - clearly.

Canon 1DC. This is a camera I love. Take all the features you love about a Canon full frame DSLR, put them into the 1DC, add a few more features, throw in 4K, and

you have the 1DC. The 1DC has a full frame sensor but crops that sensor to Super 35 for 4K video, just like the C500. It shoots UHD to a compressed format (motion JPEG) but it seems to be a great codec that holds up through the editing process and is light enough to edit on most computers today (though you would need a 4K monitor and graphics card). The camera shoots with Canon's C Log color space allowing you to really work on color correction and motion. Motion JPEG works much the way raw video does by taking a high quality JPEG still image for every frame, instead of a raw one. You can also grab one of these jpegs for a still photo that's high end for ads or posters. You will still have moiré and rolling shutter with this camera, which bothers a lot of people. The camera is built on the 1D frame so it's big and it's heavy. But, it's really durable and worth it. This thing is a beast. It will also shoot very high-end stills. Like the C500, it has multiple frame rates and can also shoot HD footage. Battery life and low light performance are pretty good. It has an 1/8 audio jack for inputting audio (I don't mind this, but a lot of people do - XLR would be better but this is typical for a DSLR), a headphone jack, audio levels, and audio control with a great pre amp for recording sound. It also has an EF mount, which will take all of your Canon lenses. This is a great camera. This is really the only run and gun 4K camera out now that is perfect for journalists. The only real drawbacks are the price (come on Canon, lower that tag) and the compressed UHD, but you really don't notice the compression. It shoots 8bit 4:2:2 and 4:2:0 color spaces and will do the broadcast standard REC709, which is becoming increasingly more popular especially if you want your video to air on broadcast TV. One other note, it doesn't output 4K over HDMI. It records to CF cards in the camera, which is great! But the fact that you can't use an external recorder for 4K is not great. It's definitely a contender and worth looking at. It's a good companion for the C500, a good B camera, and it can be a main camera too. But at this price, around \$13,000, you might consider making the jump up to the C500.

Sony F65. This is a terrific 4K camera. It's Sony's flagship and is for very high-end commercials and movies. It's expensive - the price of a Mercedes Benz, and that's just for the camera. Then you need lenses (Cooke optics are the recommended lenses here, but that will run you the cost of a Bentley) batteries, media, and more. But, it's one of the top cameras on the market. A lot of major big budget TV shows, prime time dramas mostly, are shot with it. It has a 20 megapixel, Super 35mm sensor and shoots DCI HD and UHD, 16bit raw video. The camera has a PL mount and it needs serious accessories and rigging. It shoots in Sony's special color space with 4:4:4

color. The F65 will shoot up to 120 frames a second in 4K and shoots directly to on board memory cards. This camera has 2 XLR audio inputs and a headphone jack for monitoring. The pre amps in the camera are among the best in the business. Audio sounds great on board; although when shooting a film or commercial, you are almost always recording dual audio and syncing later. You have 4K output via SDI for monitoring, recording to an external device or something else. You also have time code and gen lock for time code, in order to lock the time code to another cam or device. This camera can also shoot in the broadcast standard REC 709 color space. This is a great camera. I am just not sure you need to spend this much anymore, and even if you do, I'm not sure this would be my choice. But, it is a great camera with terrific results.

Sony F55 – It's very similar to the F65, but at less than half the price. This camera is used a lot for movies and TV too. Many of the features of the F65 are present in this camera and it shoots beautifully as well, it just has fewer features. The F55 has an 8.9-megapixel Super 35mm sensor, with 14 stops of dynamic range. It records to Sony's SxS cards to a compressed XAVC Intra format that is compressed and records 8 bit 4:2:2. It is not the best. The F55 uses a special FZ mount for lenses. It will shoot up to 240 frames per second in 2K recording. This camera has 2 XLR audio inputs and a headphone jack for monitoring. The pre amps in the camera are really good and provide very clean great sounding audio. Although, as I said before, when shooting a film or commercial, you are almost always recording dual audio and syncing later. It features 4K output through SDI, which means you can use an external recorder. It also shoots in the REC 709 broadcast color space and it has Gen Lock for time code.

RED. RED is the Ferrari of 4K cameras. They have a nice lineup and offer up a lot of options, even 6K video recording with their Epic M Dragon sensor. RED is a whole different world. They are the most technically advanced and impressive cameras out there. They have a minimum of 16 stops of dynamic range and can be used for stills and video. RED has its own compression for offline editing, proxies and playback. RED cameras can do a ton of frame rates in UHD, DCI HD, and some, like the Epic M dragon, can shoot them in 6K. The RED One in the early 2000s was their first camera. Red was the first to have 4K. They have their own color correction software and more. You need to be fully trained to shoot RED, and you really should be using all of their tools, like their graphics cards and software. This can all be

worth it because it's exclusive and makes you desirable to clients - but it's not cheap.

One of my favorite shows on the internet right now is House of Cards, which is shot with an Epic. It looks beautiful. So does everything shot on a RED. The cameras have all the bells and whistles. They have multiple output options too, including SDI and HDMI. The RED cameras only take AES/EBU embedded digital audio over SDI. That means you need an expensive field mixer or other mixer, or you will have to record dual audio and sync it later. REDs are loud because the fans need to cool a lot as they tend to overheat easily and they eat batteries quickly. My only issue with RED is that no matter what, I cannot seem to justify the expenditure with them, or the workflow, or the fact that they are temperamental, at best. I love the results. I love that the cameras are computers and are designed by computer people, not camera people. I love that they do things differently, are creative, and don't follow the rules. But sometimes, we have rules for a reason. I love a lot of things about RED. I think they are perfect for a big important shoot. However, I would rent, not buy. The REDs shoot their own uncompressed raw codec and boast global shutters. The REDs are tremendous. I would love to have one. But again, I think it's better as a rental option.

Go Pro - By far this revolutionary camera company changed the way we shoot, the way we think, and what we shoot. The Hero3+ Black Series shoots raw protune (their own special raw codec) 4K video at 15 frames per second (UHD and 12 frames of DCI HD), 9 frames less than the minimum I would like. However, this can be used for all sorts of stunt shots and it is by far the cheapest and probably the most durable 4K camera. I am sure future versions will be even better and we will see better frame rates. For under \$400, this is very impressive. It has a fixed fisheye wide-angle lens that can be cropped and autofocus. Battery life is terrible and I have never had an affinity for it, but I do appreciate them. However, if you can get it working you will amaze everyone with the results. Low light performance is improved. But, when you feed it too much light it has issues with hot spots and dynamic range. Hey, what do you want for this ultra tiny crash cam? View the footage through a smart phone app or with the optional LCD screen, either of which I recommend, or you won't know what you are shooting. Oddly enough, you really need a robust computer like we talked about earlier, to even view the footage off here. You can jam audio in with a 1/8 cable thanks to a mic input. It does have micro HDMI out, but not for 4K. I would say buy a few of these if you don't already have them, but you probably do -

it seems like everyone does.

I wish Nikon had a 4K camera. I am sure it will come eventually and be amazing. I love the D800 and D4s. But, Nikon does not have a 4K camera and I don't know if they have plans for one in the future. I hope they do. Nikon has amazing image quality, great features, and reasonable pricing. I think a lot of times they are ahead of the curve (they started the DSLR video craze by being the first to put video capabilities in DSLRs) and their latest HD DSLRs are remarkable. Their lenses are also amazing. There is just something so real and honest about Nikon's images. Hopefully, they will jump into 4K with both feet, but right now, they have not indicated that they will. Check out the D800 and the D4s, as well as their lower end cameras, if you need great HD cameras with awesome features and reasonable pricing. I do have faith in them. I think eventually they will have something and it will be worth the wait. I hope it's not too long.

Remember, you will probably want to go with the camera that best suits your needs or at least suits your needs for this job. You are really marrying this gear, especially if you go for the higher end stuff. So, pick wisely and think about what kinds of things you shoot most often and what your clients want. Think about your infrastructure, workflow, and the computers. Think about the fact that you probably will need more than one camera, not only for multi cam shoots (Although a good reason, you probably want matching cameras or at the least the same brands. You most likely won't want to mix HD and 4K cameras because the image quality will be noticeably different), but also as a backup for multiple shoots on the same day with different crews, for troubleshooting, workflow, comfort, shared batteries, external recorders, hard drives or memory cards, lenses, etc. Think about how you will deliver and play it back. I recommend using an on camera monitor that is super sharp like the Odyssey Q7; it's big and has multiple inputs and outputs and records. On all of these cams, I also recommend going to an external recorder. If you do get a monitor, please realize it won't display in 4K, as there currently is no camera top monitor capable of displaying in 4K, even the ones that can record in it, display in a different format. There currently aren't many playback devices. You're getting in early. You will be up to speed and have a lot of shoots under your belt quickly, which is great! You probably also want to use great camera supports, like Steadicams, Freely's Movi for stabilization, cranes, dollies, and sliders. All of these tools and others will help make your production look more professional and cinematic, and

your images even more stunning (we will talk more about these tools and others like them in future articles). So, take the plunge! Be creative, start shooting amazing stuff, and have fun! Just make sure you're ready. Remember, there is currently no perfect camera and certainly no perfect camera for every job. There is no perfect workflow either. You have to make it perfect for you. You're going to have to learn it, know it, work it, and work with it. You're going to have to decide which trade offs you can live with and which are deal breakers. Remember this isn't a hobby; you need to make money and a good deal of it. Some cameras will help you command more dollars and get you bigger jobs.

Do you have to shoot differently for 4K. Sure you do! Lighting becomes more important again! Audio was always important but it has to be perfect now to match these stunning visuals. You have to shoot to be able to crop for HD. Which is awesome. You can even crop in a lot (zoom in so to speak and not lose much detail or add much noise if you want to). Makeup is important again as 4K will see everything including bad skin and bad makeup. Also building great sets and scenery is super important as 4K is unforgiving. The biggest thing I can say is do a lot of testing of everything: the cameras, the lighting, the makeup, the sets, the audio and the work flow. Know how everything works and comes together. Practice, practice practice... especially the color correction part.

Hopefully this article was helpful to you, offered some good insight, great tips and advice. Since I am a TV guy I'll say, Thank You for reading, until next time ...

Be Terrific

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4K and the View from Australia

Australian moviemakers – I tend not to use the term ‘filmmakers’ due to there being so few of us using film these days – are not in the simplest of positions when it comes to 4K. Our national infrastructure is fraught with challenges and there are few signs of improvements on the horizon. If anything, we have been repeatedly leaping backwards since September of 2013.

On the other hand, relying solely on national conditions and opportunities hardly guarantees a viable lifelong career in any form of media production here. Australians have been forced by national conditions and the need to earn a living outside this country into ingenuity for decades, even centuries since the founding of British penal colonies on this land from 1788 onwards.

Ingenuity – the quality of being clever, original and inventive – is evident in the attitudes and successes of at least two Australian companies whose products are used and praised by moviemakers around the world. Atomos and Blackmagic Design, both from the southern city of Melbourne interestingly enough, have exercised ingenuity in the form of creativity, innovation and a willingness to price their products below the norm.

Those three traits are not necessarily commonplace in Australian business culture. ‘Creative’ and ‘innovative’ were words viewed with some suspicion in Western Australia – the westernmost state of Australia – when I was growing up and during my working life there. Those two words were more likely to be applied to the bookkeeping practices of certain WA corporations during the height of WA Inc. in the 1980s and beyond than anything in the art world.

Real creativity and innovation are to be found, too, amongst Australia’s scientists,

technologists and engineers, many of whom are forced to move outside Australia to further their careers or to sell the technologies they developed here at home in order to take them to market on a global basis.

Australia has a surfeit of sunlight – a fact worth reminding ourselves of despite recent gloomy mid-winter days – and roughly 2.5 million private citizens ready to invest in installing photovoltaics aka solar panels on the roofs of over 1 million homes. As of time of writing, there are now 23,569,563 people living in Australia, so that is reasonable percentage.

Australian businesses and governments have proven far less ready than Australian citizens to invest in solar power generation and fundamental research and development. Governments such as those in Germany, Japan, China and South Korea are outstripping us in solar R&D and in building infrastructure. Australian solar scientists are reportedly involved in that research overseas. I have even seen Australian scientists presenting on behalf of US federal government solar initiatives in San Francisco.

As with solar infrastructure, so digital infrastructure. During 2013 many Australia media outlets famously reported that Apple co-founder Steve Wozniak was planning to move to Australia and take out Australian citizenship because of the now previous federal government's fibre-to-the-premises National Broadband Network – FTTP via the NBN for those who appreciate acronyms.

The current very conservative, theoretically business-focussed, federal government seems to be doing its best to limit the ability of Australians to do business in a contemporary, digital, high-tech manner within this country and especially outside of it. Many parts of Australia, urban and rural, are high-speed broadband black-spots and appear likely to remain so now that FTTP rollouts are being wound down and replaced with fibre-to-the-node (FTTN), a failed technology that has already failed in the other countries to try it.

Those areas without fibre of any kind now or in the future, whether FTTP or FTTN, such as this generally wealthy cluster of suburbs in Sydney's north, are condemned to slow ADSL (Asymmetric digital subscriber line) running over rotting and often illicitly thin copper wiring laid down over a century ago and poorly

maintained since.

Slow and rotting not only in my own personal experience of it when living in two different locations in this part of Sydney. While writing this article, I checked the broadband options available here in both at the federal government's MyBroadband website. The results are enough to make one weep, with even the local ADSL service rated no higher than D.

One could, if so inclined, pay far more for access to a privately-built HFC (Hybrid fibre-coaxial) cable network strung up on telegraph poles and rated A for quality but the download and upload allowances and costs are not competitive nor attractive. We have no FTTP nor FTTN via optical fibre in these suburbs and are not likely too. This area may remain a permanent Internet black-spot.

Western Australian internet access provider iiNet has made hay out of this commonplace situation with its recent TV commercials comparing Australia's broadband with those of Romania and Slovakia. Both fare far better than us for download speed and I wager our upload speed is tragic by comparison too.

iiNet offers NBN high-speed broadband solutions to those lucky enough to access them but iiNet cannot bring any of its offerings to this suburb – only three ISPs are permitted to use the local telephone exchange for ADSL and iiNet is not one of them.

Turgid upload speeds adversely affect my ability to carry out my own business and when contracted as a producer in the corporate sector working on foreign projects at all hours of day and night whether from the office and especially from home. Unless I make upload arrangements with a production studio in the distant southern inner suburbs I will continue to be restrained in my ability to share movies and footage with clients. Apparently that is a situation common to movie directors and producers in this city.

If Australia's moviemakers are constrained in our work by outdated Internet infrastructure then consider the situation for erstwhile 4K content broadcasters and consumers. Australian broadcasters switched over from analog to digital terrestrial broadcast signals up until December 10, 2013. Now all Australian television is

broadcast digitally with the majority of channels broadcasting in PAL 576i.

HD TV formats in use here include 576p, 720p and 1080i. Industry informants tell me that broadcasters have cut back the number of HD channels and HD broadcasts since high definition broadcasting began. There is no sign of 4K (UltraHD) broadcasts appearing any time soon.

On the other hand 4K UltraHD TV sets are in abundance in retailers around the nation such as the JB Hi-Fi and Harvey Norman chain stores. Prices continue to drop and screen size and choice of geometries – curved screens or flat ones – increases.

576i on an UltraHD 4K TV screen hardly makes the most of that couple or so thousand dollars you just dropped on the latest TV set. The enthusiasm in the US that greeted Netflix's announcement it had began streaming UltraHD 4K content early May 2014 was not matched in Australia – Netflix has yet to appear on these shores in any form.

Any above-board form that is. According to various reports, it is possible to break through the Netflix geo-blocking by signing up to a virtual private network (VPN) then subscribing to Netflix as if one lived in the United States. Meanwhile Australian-based, internationally active cinema group and movie producer Village Roadshow has announced it is in negotiations with Netflix to bring its streaming service to Australia. Will UltraHD 4K Netflix follow? Likely not anytime soon.

Village Roadshow Pictures punches well above its Australian origins as do so many Australian moviemakers whether located here or elsewhere. Australian filmmakers have been industry leaders since the Lumière brothers first screened their a film in Paris on December 28, 1895.

The first feature-length narrative film ever was *The Story of the Kelly Gang* produced Australia in 1906. That movie was a commercial success in this country as well as the United Kingdom. Melbourne, home of Atomos and Blackmagic Design, was also the home of one of the world's first film studios, the Limelight Department owned by the Salvation Army, which produced around 300 religious, commercial and government films over its 19 years in the movie business from 1897 to 1910.

Coming Village Roadshow features include The Wachowskis' Jupiter Ascending and George Miller's Mad Max: Fury Road, while current and past screening features include Baz Luhrmann's The Great Gatsby, Tom Cruise star vehicle Edge of Tomorrow directed by Doug Liman and The LEGO Movie, which was animated by Animal Logic at Fox Studios.

Taking on work of this calibre requires heavyweight production facilities of the sort that Animal Logic has been building since its inception in 1991. The most famous and influential feature film that Animal Logic worked on was another Wachowskis feature, The Matrix. A George Miller project, Happy Feet, as far from Mad Max as a movie could get, was Animal Logic's first computer-animated feature film.

What has all this above-our-weight achievement got to do with 4K? Australian moviemakers are shooting, storing and often editing in 4K right now. 4K acquisition is a daily reality here whether it is done with RED, Blackmagic or Canon EOS C500 cameras. 4K-capable storage to the tune of petabytes is available at Fox Studios and other production facilities on the east coast of Australia. We have editing, color and finishing facilities able to easily handle 4K and those post-production houses have 4K feeds and screens in house.

What we don't have is 4K projector-equipped cinemas, 4K streaming-capable Internet infrastructure and Australian clients commissioning 4K-finished projects. Those three parts of the equation are the province of non-Australian clients or Australian production companies catering for the non-Australian market and most likely now based in those same foreign markets, as is the case with Village Roadshow Entertainment Group.

Creative Australians – at least the ones that I know and long encouraged to dream big, work hard and harbour foreign ambitions during the era when I worked on an influential though now sadly defunct Australian magazine of creative arts and culture – have no choice but to keep up with the trends at least as they exist outside of this country.

It may take us quite a while to catch up with the 4K future as it is now exists in the United States and beyond, but that doesn't mean we can sit back, chew on our

hayseed and wallow in our current 1080p or less existence. As generous, good-hearted educator/practitioners like Britain's Phillip Bloom, Andrew Reid of EOSHD.com and others remind us, we must have 4K even if we don't absolutely need it, at the moment.

Thank goodness too for the existence of those wonderful US, Japanese and Australian companies who are helping us in the quest to acquire 4K footage easily, affordably and without breaking our backs.

And you never know, an Australian company might just solve the problem of getting 4K content to Australia's plethora of 4K TV screens by thinking different in ways that other Australians have since The Story of the Kelly Gang.

Karin Gottschalk

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Lance Jones

Bio:

Lance is a Wellington, New Zealand based filmmaker, visual effects guru, and occasional entrepreneur. He is also known for his work as the colour scientist behind Rubber Monkey Softwares' unique FilmConvert conversion technology.

filmconvert.com

Contribution:

I Love 4K.

Having shot in, and used a 4K workflow on quite a few projects over a number of years already, I can't tell you the number of times that having that extra resolution on has saved my bacon, particularly on things going to HD.

In docos, the advantage is huge, as you can shoot wide, then choose your framing later. In dramas, the benefit is almost as grand for subtle reframes and moves that you may have missed.

4K for a 4K project?

Well, there the extra resolution is a bit of a challenge for my assistant camera guys' follow focus abilities. Set and production designers fret about the extra resolution, and for good reason, as you can see every detail, so all the time-worn traditions of fudging set quality get thrown out the window, while of course, our fine VFX folks need to push more pixels, and more detail in everything which can be a challenge on today's ever accelerating schedules.

As to the future, I think that simply put, shooting in 4K is fantastic. This is one of those cases where more really is more.

-Lance Jones

planetMitch

Bio:

Founder and chief astronomer at planet5D.com - yep, I decided to add some of my own thoughts to the ebook even tho in the introduction I said I wouldn't - but since I could put it at the end after everyone else, at least I wouldn't spoil everyone else's thoughts before you got to them.

Contribution:

Am I excited about 4k video? Frankly no.

While it is at times very exciting and 'sexy' to see some amazing details in videos on the web (and I feel like nature videos or sports are the most applicable), for everyday use and especially for dramatic or even corporate work, it seems like major overkill to me.

When you see 4k demos, what is usually on the screen? Nature or sports.

Sure you do see people every now and then, but the vast majority of what you see critters or nature. It is incredibly sharp and there's usually virtually no depth of field - everything is in focus.

I recently had the chance to speak with a Director of Photography who is working on a TV show - his two main reasons why he wasn't shooting in 4k - cost and people. The studios don't have enough budget to produce the shows now and adding 10-15% extra to shoot, process, and edit 4k is out of the picture (bad pun eh?). The other issue is that the talent doesn't like so much detail - especially in closeup shots!

Now I realize that eventually we'll get to 4k - just like we moved from SD to HD years ago... but for now, there's not much incentive to be on the bleeding edge if you ask me.

Recent industry reports suggested there would be just over 1 million 4k TVs in people's homes *worldwide* (yes I said worldwide) by the end of 2015. That's way less

than 1% - close to probably 0.1%!

The TV manufacturers are trying to sell you something new so they can turn over inventory but I have a feeling that many people aren't going for it just like they didn't go for BluRay DVDs.

And guess what! Most people can't tell much difference anyway. Heck, many people are still watching TV in Standard Def! My kids don't turn to HD channels and they don't care. They care about CONTENT.

Sure, there are reasons to shoot 4k - many filmmakers love the ability to shoot once and then re-frame like some photographers love to crop to get a closeup. But some also say that makes you lazy (tho it obviously can save setup time). I'm torn on that - but it can be a very valid reason to shoot 4k.

Without tons of delivery methods (TV, YouTube, cable, etc), there's really not much incentive to spend the extra money on 4k if you ask me. Eventually, yes.

Oh, and don't even get me started on the fact that the human eye can't usually resolve 4k beyond 8-10 feet and most people sit further away from their TVs than that...

Anyway, thanks so much for reading the book! Hope it has given you some perspective on what is going on in the industry.

And thanks for being a part of the planet5D community!

planetMitch