Jon Fauer, ASC www.fdtimes.com July 2016 Issue 76

FILM AND DIGITAL TIMES

Art, Technique, and Technology in Motion Picture Production Worldwide

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FILM AND DIGITAL TIMES

Art, Technique and Technology

Film and Digital Times is the guide to technique and technology, tools and how-tos for Cinematographers, Photographers, Directors, Producers, Studio Executives, Camera Assistants, Camera Operators, Grips, Gaffers, Crews, Rental Houses, and Manufacturers.

It's written, edited, and published by Jon Fauer, ASC, an award-winning Cinematographer and Director. He is the author of 14 bestselling books—over 120,000 in print—famous for their user-friendly way of explaining things. With inside-the-industry "secrets-of the-pros" information, *Film and Digital Times* is delivered to you by subscription or invitation, online or on paper. We don't take ads and are supported by readers and sponsors.

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Cover: Onboard the International Space Station, NASA astronaut Kjell Lindgren holds an IMAX-Canon C500-Codex camera with ARRI/ZEISS 12mm T1.3 Master Prime and fistful of lenses: Canon CN-E 15.5-47mm T2.8 Compact Cinema Zoom, Canon Cinema Prime CN-E 14mm T3.1 L F and CN-E24mm T1.5 L F used in filming "A Beautiful Planet." Photo courtesy of NASA.

This page, above: European Space Agency (ESA) astronaut Samantha Cristoforetti photographs earth from the Cupola onboard the International Space Station. Photo courtesy of NASA.

At left: NASA Commander Barry (Butch) Willmore on a spacewalk to repair the exterior of the International Space Station. It's almost 300° on the sun side of the space station and -275° in the shade. Photo courtesy of NASA.

NASA Commander Terry Virts with Canon 1D C at the window of the International Space Station's Cupola Observation Module. Photo onboard the International Space Station (ISS) courtesy of NASA.

The IMAX production *A Beautiful Planet* opened in theaters on April 29. One day earlier, I discussed its technique and technology with James Neihouse, ASC and Marsha Ivins, along with Tim Smith and Leigh Nofi of Canon. James was driving on I-95 in Florida. Marsha was at home in Houston, Texas.

Marsha Ivins, former NASA Astronaut who flew on five Space Shuttle missions, was a consultant on the film, coordinating with NASA and IMAX. Toni Myers wrote, produced and directed. Jennifer Lawrence narrated.

James Neihouse, with more than 30 IMAX film credits, trained the Astronauts in cinematography, as he has done on more than 25 other Shuttle and Space Station missions. As Variety wrote, "Short of putting Emmanuel Lubezki through Astronaut training, it's difficult to imagine more rapturously beautiful images of the Earth from orbit than those supplied by *A Beautiful Planet*, the latest collaboration between IMAX and NASA."

This was the first IMAX feature in space to use digital cameras: Canon EOS C500 4K Digital Cinema Camera and Canon EOS 1D C 4K DSLR. The cameras were delivered from Earth to the International Space Station (ISS) in September 2014 on an unmanned SpaceX Dragon. The Astronauts took turns as DPs: NASA Astronauts Terry Virts, Kjell Lindgren, Butch Wilmore, and Scott Kelly; European Space Agency Astronaut Samantha Cristoforetti; and Japan Aerospace Exploration Agency (JAXA) Astronaut Kimiya Yui.

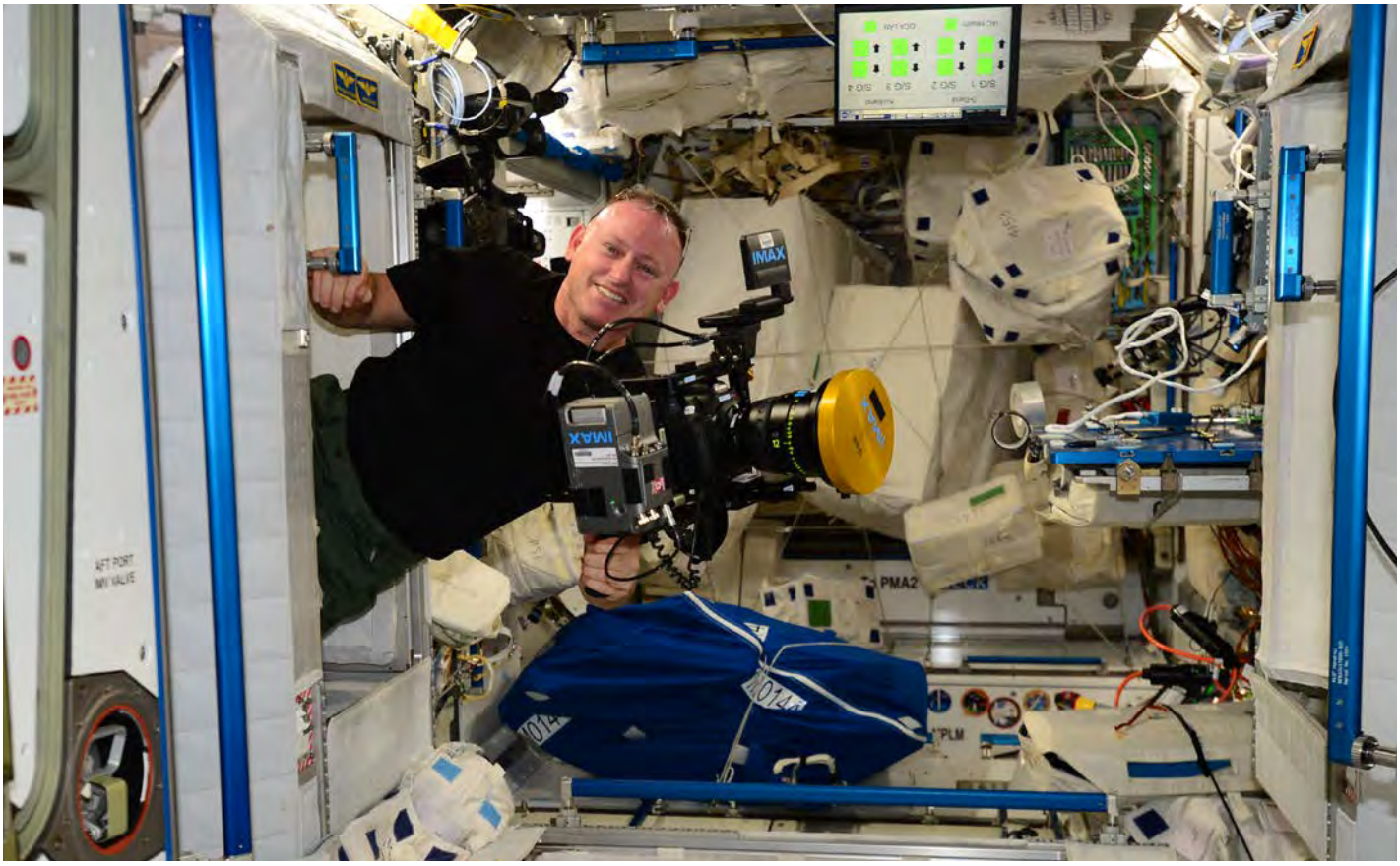
In the film, daily life aboard the ISS is punctuated by spectacular scenes: lightning storms, volcanoes, coral reefs, the Aurora Borealis dancing in breathtaking high resolution. Other images are ominous: glaringly bright city lights, drought, deforestation, and the effects of climate change worldwide.

Quick Technical summary: Three Canon EOS C500 4K Digital Cinema Camera and two EOS-1D C cameras were sent to the ISS. They were used one at a time. The C500 has a 16:9 S35, 8.85-megapixel (4096 x 2160) CMOS image sensor that records to internal CompactFlash cards and simultaneously outputs uncompressed RAW. RAW Data was recorded onto a Codex Onboard S Plus recorder. The Canon EOS-1D C Digital SLR camera has a 5208 x 3477 pixel CMOS sensor for Full Frame Stills, and also shoots motion JPEG compressed 4K video (4096 x 2160).

JON FAUER: Thanks for taking the time to join this conversation. Jim, please tell me about the camera equipment used on *A Beautiful Planet*, why you chose it, and how.

JAMES NEIHOUSE: When we first started this whole process, NASA told us we couldn't make the film...on film. "You're not going to be able to fly actual motion picture film," they said. "No more IMAX film because we don't have a Space Shuttle to fly up and back." (One 1200' roll of 65mm/15-perf IMAX motion picture film weighs 12 lb and runs a mere 90 seconds.) This time they would use the SpaceX Dragon to get things back and forth. So we had to pick digital cameras.

We started the search about four years ago—looking for something that would come close to what real IMAX looks like. We rounded up a bunch of the best cameras at the time and ultimately picked the Canon C500 because it looked best overall. It had un-



The first view in space of the the IMAX-Canon C500-Codex camera rig, with ARRI/ZEISS 12mm T1.3 Master Prime, after NASA Commander Barry (Butch) Wilmore assembled it for the first time. Photo courtesy NASA.

compressed 4K output and I felt that we needed every bit of data we could get from the camera to try to match IMAX. To record uncompressed RAW from the C500, we used the Codex S Plus onboard recorder.

We also picked the Canon EOS-1D C to use as a full frame still camera, with 5K resolution (5208 x 3477 effective pixels). Its full frame 1.5:1 aspect ratio came fairly close to the 1.44:1 IMAX aspect ratio, and has 16 bit color space. The 1D C was used to take multiple exposure image sequences that we converted to real time, 24 fps motion with secret sauces in post production. The other reason I picked the 1D C was that it had a 4K in-camera Motion JPEG video recording option. I felt it would be good to have a very small camera body that enabled us to get into tight places, even if it was compressed. So we had two Canon full motion systems. Above all, I wanted the Canon optics. I love the Canon glass—it is just beautiful.

Marsha, I heard that you had to rework the plexi window that the Astronauts were shooting through. Can you tell us about that, please?

MARSHA: We started building the ISS in 2000, and we carried each module to be added to the ISS in the cargo bay of the Shuttle, one at a time. The Cupola was put on board in 2010. The Cupola is a module that consists of 7 windows—six circumferential and one nadir (center) window facing Earth. It has nice, lovely, optical glass that NASA then covered with cheap, non-optical Plexiglas in order to protect the real glass. Over the years that the module has been in space, the Plexiglas covers have been bumped and scratched. Because it's such a soft material, it is easily scratched and difficult to clean. When there's dirt and grime on it, and then you try to clean it, you basically scratch it more. Shooting any picture through one of those windows reveals all the scratches.

So, in order to save IMAX an arm and a leg in post-production costs trying to remove scratches digitally—many of which they probably couldn't have taken out anyway—we asked NASA if it would be possible to design and fly a new protection for the windows that allows you access to the real window for shooting. We had the NASA engineers basically design it: they told us the material, the thickness, the kind of fasteners that would be needed, what the opening should be, and so on. We had the thermal people bless it. We had everybody who would have done the NASA design get involved, but then we had IMAX build it. We had it certified as a piece of payload hardware, which was how we flew the cameras. We had it manifested to launch. Then we got the crew some time for installation. It's still in place. They continue shooting regular NASA stuff through it now.

When shooting through the Cupola, do you have to put something like a mattebox anti-reflection donut ring around the front of the lens?

MARSHA: All of the lenses that NASA allows on orbit, and that includes payload and regular NASA equipment, are protected with a bump shield on the front. That's a protective covering around the rim of the lens—so the metal of the lens doesn't actually ever touch a window. We also managed reflections with


Cinematographer Akira Sako, JSC (L) and Director Yoshinari Nishikôri (R)

By Yasuaki Mitsuwa

Director Yoshinari Nishikôri and Cinematographer Akira Sako, JSC, recently completed the feature Tatara Samurai. *This interview took place at the Imagica head office in Tokyo after the first screening of the film in April.*

FILM AND DIGITAL TIMES JAPAN (FDTJ): Tell us about the film *Tatara Samurai*.

DIRECTOR YOSHINARI NISHIKÔRI (N): "Tatara" is a unique steelmaking method that uses a foot-operated bellows to forge Japanese swords. The process, which is called "Tatara-buki," has been employed for 1,000 years. I wanted to make a film about Tatara and it came true. The film is called *Tatara Samurai*. The story is set in Izumo, Japan during the 16th Century—a period of constant warfare. The main character is a young man who admires the Samurai, leaves his home village and discovers the importance of Tatara steel making. Izumo is the birthplace of many Japanese traditions, such as "Kabuki," "Sake," and "Sumo" wrestling. Tamahagane or Tatara steel in Japanese swords is only produced there. This is a story about the legacy of steel making.

I heard the film is based on an original story you wrote, Mr. Nishikôri. Why did you want to make a film about "Tatara"?

N: The Japanese sword is a great work of art and its material, Tatara steel, is the best steel in the world. Curiously enough, many foreign people know more about Japanese swords than we do. The sword smith who worked on our film said that Steven Spielberg came to visit him just to buy a Japanese sword. I am ashamed that I did not even know that a Japanese sword cannot be made without the traditional steel techniques that come from ancient times. Tatara steel is the purest steel even today. It cannot be produced by the latest high-tech computer-controlled furnace. Nobody knows why the ancient Japanese knew about such high technology. I would say that this should be one of seven wonders of the world, like how to build Pyramids.

When did your idea to shoot a film about Tatara first come up?

N: About five years ago. At that time, I felt there were some tendencies that "Analog is old-fashioned and outdated and Digital is everything." It was around the year 2011 when we had the Great East Japan Earthquake. Analog skills and techniques, such as intuitional judgement at the site, saved many human lives. This is one of the reasons I was attracted to the concept. Also, I was born and raised in Izumo and have heard many tales of old Japan. I found out that many expensive luxury foods in Tokyo are made by traditional methods. For example, we often pay more at barbecue restaurants where we have to cook by ourselves on a small portable stove with charcoal. Hand-made organic Miso (soybean paste) is more expensive in supermarkets. We can buy cheaper ones that are mass-produced and have better preservatives, but food additives for preservation are sometimes not good for one's health. I thought analog technologies could be better for people and "Tatara" is a good theme. Just then, I discusses with Sako-san (Cinematographer) about the advantages that film still has over digital. It's OK if people do not notice this, but it seems that too many are saying that digital is better than film without knowing the reason. We are in an age of many uncertainties. Somebody says something in the media, rumors are easily spread and turned into common knowledge, while truth may be ignored. I wanted to tell a story about the many good "analog" things in Japan through the film.

When did you decide to film "Tatara" on film?

N: It began at a meeting with HIRO, Executive Producer of the film and former leader of the Japanese band EXILE, a popular vocal and dance group in Japan consisting of 19 members. He loves movies and had always requested 35mm film when shooting his music videos. My previous film, "Konshin," was also shot on film. When we met, we were excited to talk about our next film and we agreed to do it on 35mm film.

But many features are shot on digital. What about Alexa?

N: I love to shoot beautiful natural scenery and I had many ideas about locations. I think this film has twice as many nature scenes as typical films. I was concerned about representing the sun, water and other natural scenes as beautifully in digital and was a bit frustrated. Sako-san agreed with me and we decided to go with film. Furthermore, many objects in the story, such as flames and swords, are analog things. Sako-san and I arrived at a conclusion: Tatara-buki is a technology of 1,000 years ago but is still state-of-the-art. Film is a technology invented 100 years ago but is also still the state-of-the-art. In addition to that, I have to thank HIRO, who led the project. Even though we know film is good, recently it is not easy to actually shoot a feature with it. However, he allowed us to go ahead and do it without hesitating. From that sense, we had an ideal environment to shoot on film.

Were all scenes shot on location? Are there any studio setups?

N: All the scenes were shot on location. Nothing was shot in a studio.

Were the village scenes an existing location in Shimane prefecture?

N: No. We built the village there as an outdoor set for the film—but it does not look like a set. There were many difficulties. We had to make everything from scratch. It took a lot of time, but we built a traditional forge in the village and really produced Tamahagane/Tatara steel. Buildings in the village were constructed by carpenters, plasterers and local craftspeople in Shimane. For example, the Kagura hall (a stage for traditional performing arts) was built without using any nails. All the costumes were made from hemp fabric based on historical background research.

Recently, many features only emphasize the story line. I regret this trend and want audiences to feel the atmosphere of each image. The dynamic and vivid pictures shot by Sako-san, who has much experience and expertise, are a testimony to shooting on film.

FDTJ: What were the challenges of shooting film on location?

Cinematographer Akira Sako, JSC (S): When I shoot on film, I do not have to think about unnecessary things and I can concentrate on my work. I do not have to play tricks and can just shoot things as straightforward as they are. I was able to reproduce and express the natural colors of flames, leaves and other elements using motion picture film. The sword smith told me that they are always checking the colors of the flames to adjust and control the temperature of the forge. In the digital world, bright areas can become overexposed at a certain level: for example, sparks of fire will be just white dots. We wanted to capture the natural color of the sparks and film's power of maintaining their original red color was great.

N: For me, the only issue was cost. I have shot all my features on film except for "Wasao." So I am used to it and I personally think film is more convenient than digital. I think it was the right choice to shoot on film to describe the existence of Japanese people from ancient times, who lived together with nature and with their "analog" sense that we all used to have.

What cameras and lenses did you use for the project? And how did you select them?

S: Our A and B cameras were Panavision Millennium XL. The C camera was an Arriflex 235, chosen because of its mobility. Lenses were C-series Anamorphic lenses and most scenes were shot with them. We rented a set and shared them among all three cameras. Also, we had an Angenieux 25-250 HR Anamorphic modified zoom lens. The Arriflex 235 was always ready for shooting nature scenes. The sun and clouds were always changing and never waited for us.

I think it is a worldwide trend that vintage lenses are popular and anamorphic shooting is in fashion. The same is true here. New lenses have better optical quality and provide us with sharp, crisp and nice images, but I prefer old lenses because of their unique "taste" and look, like bokeh and flare. My descriptions sound clumsy, but each lens has its own feeling. The Panavision C-series lenses were very popular. We also used one Panavision 50mm E-series prime, which we could not do without. All the indoor scenes were shot with prime lenses.

FDTJ: How did you establish the look of this movie?

S: I avoided using filters as much as possible. That is because I wanted to represent the colors and textures that the subject actually had—unaltered. Regarding the film stock, I tried to use Kodak Vision3 50D 5203 as much as I could. I wanted the least amount of grain and the most resolution. After all, there are only 4 kinds of color film negative available in the market now. I used all four. The 200T was for the beginning of the film, flashbacks and snow scenes. 500T was for night scenes and 250D was for scenes where I could not use 50D. If 250D was not enough, I shot

Lighting with Paint: Vintage 1876

Ernest Meissonier *Friedland.* ca. 1876. Metropolitan Museum of Art

James Tissot, *A Passing Storm.* 1876. Beaverbrook Art Gallery

Pierre-Auguste Renoir, *Bal du moulin de la Galette,* 1876. Musée d'Orsay

Édouard Manet, *Portrait of Stéphane Mallarmé.* 1876. Musée d'Orsay

The Pendulum of Styles

The following review was uncovered in the dusty archives at The Duchy of Grand Fenwick Cinematheque. Then, as now, style was a dialectic. Artists experimented. Tastes changed. Academies and the Establishment were challenged. In one year, 1876, we see a spate of styles. Bold artists attempted to distinguish themselves from their confrères. At the same time, the specter of still photography loomed. It was not only an artistic but also an economic challenge. How could an artist like Meissonier continue to justify fourteen years of work on one painting when a photographer like Gaspard-Félix Tournachon (Nadar) could ascend in a balloon and shoot aerial stills in one day?

The authenticity of this document cannot be validated...

1876. One hundred years have passed since the United States declared independence. Sixty-nine years have gone by since Napoleon defeated the Russian army at the Battle of Friedland. And on a fine day today, in 1876, American department store magnate Alexander T. Stewart has purchased Ernest Meissonier's *Friedland* painting, sight unseen, for the astronomical sum of $60,000.

It is understandable. Meissonier is the highest-paid artist in France. He specializes in painting scenes of action, adventure and romanticized battles. With an attention to detail that some call obsessive, and others will later see in Kubrick, Ernest Meissonier has been working on *Friedland* for fourteen years. He installed what he called a dolly in his vast garden near the Seine. Workmen pushed the dolly at breakneck speed as Meissonier perched handheld with a sketch pad to capture the precise details of horses galloping back and forth.

Friedland will surely inspire future artists with its attention to detail and 4K resolution. It's clear that Meissonier, who goes by the nickname "Chèvre" (goat) used a wide angle, 14mm Master Prime lens. "It's all about composition and detail," he says.

The same year, 1876, James Tissot (the former Jacques Joseph Tissot) paints his mistress and muse Kathleen Newton in *A Passing Storm*. Like Meissonier, Tissot is fabulously wealthy while his Impressionist friends are struggling. Tissot also favors a 4K canvas and fine detail. His lighting is golden, backlit, contrasty, HDR. The camera notes are difficult to decipher, but we think we can make out the words "25mm Summicron-C, no filter, Mole LED 3200K Tener with Rosco 1/2 CTO coming through window."

Enter Pierre-Auguste Renoir. "All our canvases, paints and brushes come from the same suppliers," he complains to colleagues one alcohol-drenched evening at The Café Guerbois. "Ever since that American, John Rand, invented metal paint tubes, all our images feel the same. They are too pristine, too perfect, too digital." Renoir longs for the good old days, when men were men, and painters ground their own pigments. Or, at least their assistants did.

"Zut alors," shouts Manet. "What we Impressionists should do is to removing the whitewashed coatings of our canvases. Make them vintage. Blunt our sharp paintbrushes so our once fine lines become blobs and blurry blotches of light. Search the flea markets for vintage palette knives. And above all, dapple the light."

Meissonier argues, "*Friedland* is a period piece, but I avoid the technical path to a vintage look." Tissot jumps in, "I prefer to avoid flares and glare to get a vintage air. I hope my lighting, composition and art direction tell the story." Plus ça change...

The Projectionists of Cannes

Films at the Cannes Film Festival are assured the highest level of projection in the world. You may not like the films, but you will love the way they are presented. Although leading contenders for the Palme D'Or often run to posterior-numbing lengths (these are often directors cuts before purchased and shortening for distribution) at least one is assured that the exhibition on the huge screen in the Lumière Grand Theatre is perfect.

The reason for this, and in fact, in most theaters in France, is that they take cinema projection very seriously.

More than 2,000 films were screened during the 11 days at Cannes this year. 80 of the best projectionists from France handled the grueling schedule.

Supervising all of this is the CST — the French Center that supervises technical standards for Cinema. And the man in charge is Pierre-William Glenn, AFC.

A distinguished cinematographer with a list of credits that reads like the who's who of the New Wave and French Cinema, Pierre-William checks every film in every theater at Cannes in advance and attends all the main events to make sure everything runs perfectly.

On the second-to-last day, all the projectionists were treated to a lunch of oysters, seafood, Paella, and wine at the CST's pavilion on the pier. The best projectionist at Cannes was honored with an award. Great projection is still an art. If other festivals and all cinema owners understood this, the world would be their oyster.

Pierre-William Glenn, AFC (left) and Ian Troszinski, winning projectionist.

Above: Pierre-William Glenn, AFC and his oysters. Below: his favorite seafood restaurant in Cannes: Astoux et Brun at 41-43 Rue Felix Fauré.

Above: A favorite FDT lunch spot at Cannes—the Beach Restaurant and Buffet across from the Carlton Hotel.

Jin Yamashita and Yutaka Okahashi (above, l-r) taught the next class: Advanced AXS-R7 Recording. Introduced at NAB 2016, it's the bigger brother of the AXS-R5 RAW Onboard Recorder for Sony F5 and F55 cameras. Jin explained, "The new AXS-R7 doubles 4K 16-bit RAW recording from 60 fps to 120 fps with the F55 camera. It has two card slots, is slightly larger than the R5, attaches more securely to the camera and is more robust."

"It was developed in response to requests from our customers," Peter Crithary added. "The docking attachment was strengthened to withstand more rugged production environments."

The R7 can cache up to 30 seconds, which is helpful for wildlife and action camera work. It is all-metal, dust and water resistant. The cooling vents are on the side, sealed, and separate from the electronics. It comes with a V-mount battery attachment. It will require Sony F5 and F55 firmware update V8.0.

Above: Size comparison of AXS-R7 (left) and AXS-R5 (right). Note, the R7 was a pre-production model at the time this photo was taken a couple of months ago.

Below: final production AXS-R7 model

Canon Compact Servo 18-80 T4.4

Canon's Compact Servo 18-80mm T4.4 EF-mount zoom for Super 35 cine format is a new kind of hybrid lens. It combines attributes of 3 lines of Canon lenses: L-Series EF professional still photography lenses, Cinema Zooms with manual focus/iris/zoom barrels, and Cine-Servo zooms.

The 18-80 comes in an EF mount. It has optical image stabilization, something not often seen in cine lenses. Autofocus is compatible with EOS C300 Mark II and EOS C100 Mark II cameras. The optional servo handgrip is unique and very clever. It attaches with one screw. When removed, an electronic module containing the lens servo motors remains, along with its own redundant zoom rocker switch. The motors can be turned on or off. The advantage is that you don't have to recalibrate or worry about gears not meshing.

Canon's hybrid lens design combines image quality, ergonomics for video and cine, and an affordable price made possible by quantity production. The Canon Compact Servo 18-80mm Zoom Lens and ZSG-C10 accessory grip are scheduled to be available later in 2016 for a ridiculously low estimated retail price of $5,500 and $499 respectively. This is the first in a series of hybrid Compact-Servo cinematography lenses from Canon for handheld, shoulder, tripods or rigs.

Tetsushi Hibi & Yasunori Imaoka

Tetsushi Hibi (left) and Yasunori Imaoka (right) at NAB 2016.

Recently, I met with Tetsushi Hibi, Senior General Manager, Canon Optics R&D Center; Yasunori Imaoka, Group Executive, Canon Image Communication Products; Ryan Kamata, Sr Specialist, Canon USA Camera & Video Division (who also translated); and Leigh Nofi, Canon Manager of Public Relations, Corporate Communications Division.

JON FAUER: How did you come up with the concept for the new Canon Compact Servo 18-80mm T4.4 EF Zoom Lens?

YASUNORI IMAOKA: We noticed that cameras were becoming more compact—but the lenses remained the same large size. We wanted to make a zoom lens for motion picture that matched the form factor of these new cameras so that the entire acquisition system would become more compact and flexible.

We also saw the increased use of gimbal and rig stabilizers. So desired to make this lens suitable for every possible application: handheld, shoulder mounted, on rigs, gimbals, drones, remote heads, for feature, television, documentary and ENG style cinematography. We think this lens can do all that. It is the result of listening to feedback from our customers and understanding the potential need for such a lens.

We noticed that many people who use our cine cameras, or other cameras with similar form factors or price points, also use Canon EF lenses. Many requests from those users were for us to provide a motion picture specific lens with the functionality of EF zoom lenses, auto focus and image stabilization. They did not want to compromise on those functions. We incorporated those functions into the new product as well.

When did you first get the idea to create this lens?

IMAOKA: It was actually two years ago, at NAB. That's when we started discussing the idea.

Did somebody say something? What was the creative spark?

IMAOKA: During NAB 2014, we had a room set up for internal staff meetings in the hotel. Mr. Hibi and I were sitting at a table with Canon representatives from around the world. At that point, it was brought up that we needed this type of lens. That was pretty much the first time we started thinking about it. Then we did a lot of research, met many cinematographers and end-users, and discussed what would be best. We studied hard. That took some time. Then we began designing and developing the product. And

Panavision 8K Millenium DXL

Panavision had a big surprise at Cine Gear: the new Panavision 8K Millenium DXL Large Format Camera. The sensor size is the same as the RED VV 8K: 21.60 x 40.96 mm.

The camera is a collaboration between Panavision, Light Iron and RED. The result is a thoughtful, ergonomic, Panavised (in the best sense of the word) digital cinema camera. One of the big deals is the ability to record 8K RAW and 4K ProRes or Avid DNx files simultaneously.

Panavision's DXL Camera is smaller than many studio cameras, and weighs about 10 lb. It has dual main displays—on each side of the camera. Dual fans keep it cool. The custom cheeseplate has integrated electronics. The system is modular and doesn't need tools to attach and detach accessories. You can go quickly from studio to Steadicam or handheld mode with dovetails on the bottom, modular handles and cheeseplate mounting options.

It comes with the new Panavision mount for Primo 70 lenses, and will accommodate the entire line of Panavision large format optics, including the new T Series. Panavision adapters accommodate S35 and legacy 65mm lenses.

Specs (subject to change)

- Sensor: 16-bit, 35.5 Megapixel CMOS
- Maximum sensor size: 21.60 x 40.96 mm Large Format
- Max. diagonal: 46.31 mm, same as RED VV 8K
- Resolution of full sensor: 8192 x 4320 (8K)
- Region of Interest to 4.5K Anamorphic 18.9 x 22.68 mm
- Dynamic Range: 15 stops
- Max Frame Rate: 60 fps at 8K Full Frame (8192 x 4320), 75 fps at 8K 2.4:1 (8192 x 3456)
- Recording: 8K RAW, simultaneous 4K or 2K proxy (ProRes or DNx)
- Recording Media: SSD (up to 1 hour on a single magazine)
- File Type: .r3d (supported in RED SDK)
- Color Profile: Light Iron Color (compatible with all popular gamuts and transfer curves)
- Weight: 10 lbs.
- 6 independent video outputs
- Independent support of up to 6 1D LUTs or 4 3D LUTs
- Internally motorized Primo 70 lenses, wireless lens control
- Built in wireless timecode & genlock (Ambient Control Network)
- Dual menus (Operator side, Assistant side)

Elisabetta Cartoni with the new Cartoni Lambda 25 Head.

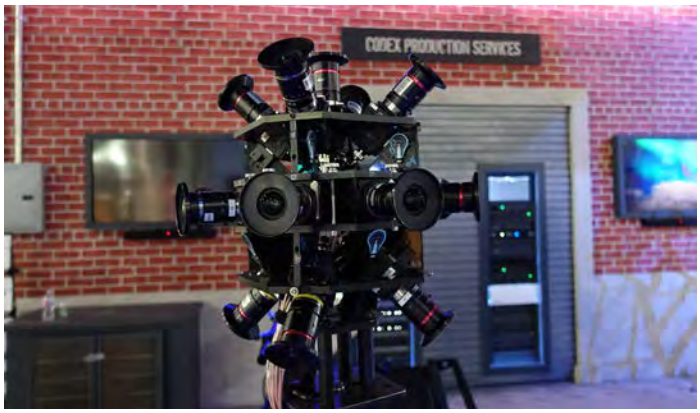
Lambda 25 Head is for cameras up to 25 kg (55 lb)

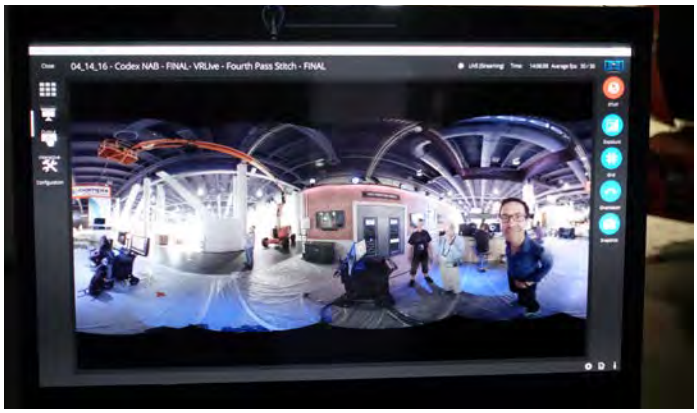
The Easyrig and Flowcine crews

Johan Hellsten new Easyrig Vario 5 Strong for cameras from 30-55 lb

Bokkelux prototype lens by a company called Bokkeh in Taiwan

Kinemax 6K prototype from Kinefinity with Bokkelux Full Frame Lens





Codex- Radiant Images VR rig with 17 Codex Action Cameras: 360 degrees, 12-bit RAW files, C-mount lens. Jens Rumberg, Codex, at right.

Titans of the Industry

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