Jon Fauer ASC www.fdtimes.com Apr 3, 2019 Canon Special Report

FILM AND DIGITAL TIMES

Art, Technique and Technology in Motion Picture Production Worldwide

Canon Sumire Primes

Seven Samurai

Toshiro Mifune in foreground as a swaggering Samurai with an oversized sword. Below: Akira Kurosawa directing *Seven Samurai* with two cameras and turrets full of primes. Photos: MovieStillsDB

Seven Samurai (Shichinin no Samurai, 1954) is the greatest foreign-language film of all time according to a BBC poll.

Akira Kurosawa directed and Toshiro Mifune starred in this sixteenth century epic of seven rōnin (masterless samurai) who help a village of poor farmers defend themselves against bandits.

If the plot sounds familiar, it is because *Seven Samurai* inspired *The Magnificent Seven*, *The Dirty Dozen, Star Wars* and countless action movies about bands of buddies assembled to do a dirty job.

Sumire

In Japanese, Sumire means "flower," "purity" or lovely."

Sumire is a popular name. It is pronounced "Soo-mee-ray."

Sumire is also the Japanese word for violet. The nuances about this flower include "Humility", "Good Faith" and "Small Happiness".

And, Sumire is the stage name of Japanese actress, singer and fashion model Sumire Matsubara.

She is the daughter of entertainers Junichi Ishida and Chiaki Matsubara. At age seven, Sumire moved to Honolulu, Hawaii with her mother. After two years in the School of Drama at Carnegie Mellon University, Sumire returned to Tokyo to pursue a career in Japanese arts and entertainment.

Recent roles include *Hawaii Five-0* and *The Shack*. Sumire received the 2015 Rising Star Award at the Asian World Film Festival.

At right, Sumire Matsubara, Japanese actress, singer and fashion model. Photo: Celebritypictures.wki

Introducing seven Sumire Prime lenses from Canon in PL-mount and covering Full Frame.

From the suggestion of *Seven Samurai* to summoning a set of seven Sumire, sagacious cinematographers surely will be sensitive to the sensual sibilance in the name, sounding softly, suggesting specific sensations of silky-smooth skin tones for successful scenes of superstars and spectacles.

Sumire is a splendid name.

Canon associates the new line of Sumire Prime cinema lenses "with a feeling of floral gentleness and beauty. In addition to Canon's renowned warm imagery, a unique optical design introduces a nuanced look as the lens aperture approaches its maximum setting. This subtly modifies the textural rendering of actors' close-ups. It also smooths the transition from areas that are in focus to out of focus regions of the image, with gentle fall-off and pleasing bokehs."

Sumire Prime

Focal Length		14 mm	20 mm	24 mm	35 mm	50 mm	85 mm	135 mm
Maximum T-Stop		T 3.1	T 1.5	T 1.5	T 1.5	T 1.3	T 1.3	T 2.2
Mount		PL mount						
Close Focus - meters		0.20 m	0.3 m	0.3 m	0.3 m	0.45 m	0.95 m	1.0 m
Close Focus - feet & inches		8"	12"	12"	12"	18"	3'2"	3'3"
Close Focus Actual Subject Area	1.5:1 FF [1]	25.2 x 16.8 cm	33.8 x 22.5 cm	28.8 x 19.2 cm	20.2 x 13.5 cm	25.0 x 16.7 cm	34.4 x 22.9 cm	21.1 x 14.1 cm
	1.78:1 S35 [2]	17.2 x 9.7 cm	23.1 x 13.0 cm	19.7 x 11.0 cm	13.8 x 7.7 cm	17.1 x 9.6 cm	23.5 x 13.2 cm	14.4 x 8.1 cm
Length (from front to flange)		86.0 mm	93.5 mm	93.5 mm	93.5 mm	93.5 mm	93.5 mm	107.6 mm
Maximum diameter (approx)		118.4 mm	118.4 mm	118.4 mm	118.4 mm	118.4 mm	118.4 mm	118.4 mm
Weight (approx)		1.2 kg	1.2 kg	1.2 kg	1.1 kg	1.1 kg	1.3 kg	1.4 kg
Front filter thread Ø			105 mm	105 mm	105 mm	105 mm	105 mm	105 mm
Front diameter		114 mm						
Number of iris blades		11						
Lens Gear Pitch (Module)		0.8						
Focus Gear Rotation		300°						
Iris Barrel Rotation		36°						

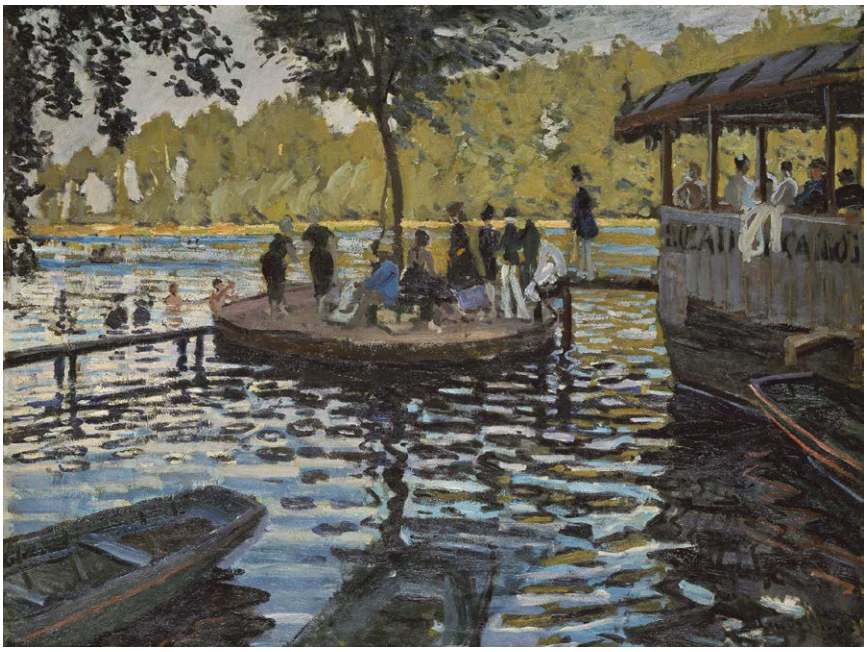
[1] Close Focus Coverage shown for 1.5:1 Aspect Ratio is for Full Frame Sensor Area of 36.0 x 24.0 mm.
[2] Close Focus Coverage shown for 1.78:1 Aspect Ratio is for Super35 Sensor Area of 24.6 x 13.8 mm.
Focus and Iris Scales on both sides of Lens. Focus Rings available in Imperial or Metric.
Camera Right Side of lens has phosphorescent Focus and Iris Marks for improved visibility at night and in dark locations.

Sumire in Impressionism

And what about the Japanese meaning of Sumire: purple flower, violet? Why would Canon, known for the warmth of their lenses, name Sumire Primes this way? These new lenses are slightly warm, not cool.

But violet is not always cool. It was a favorite color of Impressionists Renoir and Manet. The background of Renoir's *Madame Léon Clapisson* is an intense violet-yellow-red. His *La Grenouillère* and *Moulin de la Galette* are painted with a preponderance of dark violet. Monet's shadows are violet, not black. His water lilies in Argenteuil are violet-purple. This is not to suggest that Canon's Sumire Prime lenses, named for violet flowers, render violet images. Rather, Sumire is evocative of artistry and subtlety—a memorable name for an exciting new set of seven Full Frame cinema lenses in PL mounts.

Pierre-Auguste Renoir, 1883
Madame Léon Clapisson
Oil on canvas
81.2 × 65.3 cm (32 × 25 ¾ in.)
Art Institute Chicago



Claude Monet, 1869. *La Grenouillère*
Oil on canvas
74.6 x 99.7 cm / 29 3/8 x 39 1/4 in.
Metropolitan Museum of Art

Pierre-Auguste Renoir, 1876. *Bal du moulin de la Galette*
Oil on canvas
131 cm × 175 cm / 52 in × 69 in.
Musée d'Orsay, Paris

Above: Yasuyuki Tomita, Deputy Senior Manager and Chief Optical Designer at Canon, viewing Renoir at the Met Collection in New York.

Pierre-Auguste Renoir, 1888. *The Daughters of Catulle Mendès*.
Oil on canvas. 129.9 x 161.9 cm) / 51 1/8 x 63 3/4 in.
Metropolitan Museum of Art

New Canon PL mount Sumire Primes

Sumire Prime lenses with PL mounts arrive at NAB 2019, eight years into Canon's impressive Cinema EOS evolution. These lenses are an inevitable sequel in Canon's impressive "episodic series" of more than 140 million lenses, including EF, EF-S and Cinema EOS lenses. Canon's cine lenses have been largely centered on producing a broad range of Super 35mm zoom lenses.

The recent flurry of interest in Full Frame for cine spurred Canon to create a contemporary set of prime lenses with PL mounts and a unique, esthetically pleasing look. Some will ask why it took Canon so long to produce PL mount primes. Perhaps it seemed daunting that although PL lenses are a worldwide cine standard, they pale in comparison with the 70 million EF lenses delivered by late 2011, when Canon decided to embark wholeheartedly on cine cameras and lenses. Guesses on quantities of total PL lenses from all manufacturers range from 50,000 to 100,000 total.

These questions are best put in perspective with a quick review of Canon cinema lenses and Cinema EOS developments on the following pages.

Canon's Latest Line of Cinema EOS PL mount zooms and primes

S35 Zooms available in PL mount:

(Rear row) 30-300, 14.5-60, 15.5-47, 30-105.

(Middle row) 50-1000, 17-120.

Sumire Primes

Canon Cinema EOS EF and PL mount zooms and primes

S35 Zooms available in PL or EF mount:

(Rear row)
30-300, 14.5-60, 15.5-47, 30-105.

(Middle row)
50-1000, 17-120

S35 Zooms in EF mount only:
(Middle row)
70-200, 18-80.

Sumire Primes

EF Cinema Prime lenses

Canon K-35 Zoom and Primes

From Canon's collection of historic lenses at the Utsunomiya Factory

Canon 25-120 T2.8 K-35 Macro Zoom Lens
Close Focus: 4 ft
Macro Close Focus at 25mm: 1'1"
Close Focus at 120mm: 3'1"
136mm front diameter
15 iris blades.
Weight: 11.1 lb. Length: 9"

Canon K-35 Prime lens
with BNCR mount and an ARRI mount inset.

Canon's Heritage in Cinema Optics

Canon's involvement in cinema lenses actually goes back well before the Cinema EOS era. In 1972, A Sci-Tech Award was presented to Jiro Mukai and Ryusho Hirose of Canon, Inc., and Wilton R. Holm of the AMPTP Motion Picture and Television Research Center for development of the Canon K-35 Macro Zoom Lens for motion picture photography.

Of course, cinematographers today speak poetically about Canon's legendary K-35 series of prime lenses. The K-35s were used on A*liens, American Hustle, Manchester by the Sea, and Barry Lyndon.* The set of primes consisted of 18, 24, 35, 55, 85 mm—all T1.5. The 18mm had a front diameter 110mm. The rest are 80mm. (All Full Frame except 18mm).

Kavon Elhami, President of Camtec and a passionate lens afficianado, said, "The K-35s were Canon's answer to the Zeiss Super Speeds. Fast and small, the glass elements exhibit less sharpness and contrast than most modern lenses."

P+S Technik wrote, "These cinema lenses were made by Canon in the 70's and 80's and won two Sci-Tech Academy Awards for their optical design. The high-speed optical design of the K-35 series is an excellent example of Canon's optical expertise and fine lens design. The K-35 lens is slightly softer and has less contrast compared to modern lenses. But they are sharper and provide more contrast than other vintage lenses.

Jorge Diaz-Amador of CinemaTechnic wrote, "Canon K-35 Cine Lenses were introduced in 1976 in collaboration with Ed diGiulio's Cinema Products Corp. They were originally offered with BNCR mounts: 61.47mm FFD and 68.25mm lens mount diameter. The K-35 lenses were among the first series of cine lenses to use aspheric surfaces in each focal length. Aspheric lenses allow optical designers to correct aberrations using fewer lens elements than what is possible with conventional spherical optics."

In 1976, A Sci-Tech Award was presented to Hiroshi Suzukawa of Canon and Wilton R. Holm of the AMPTP Motion Picture and Television Research Center for the design and development of super-speed lenses for motion picture photography. (Note: ZEISS Super Speeds were awarded in the same year, 1976 - introduced in 1975. They had an Arri bayonet mount.)

Denny Clairmont called in, "I know a lot about the K-35 prime lenses and the K-35 25-120 zoom lenses as Terry Clairmont bought some of the first sets. The primes were designed for still cameras but since they had floating aspheric lens elements, they were so expensive to make that Canon felt still photographers would not buy them.

Then around 1972 one of the principals of Cinema Products was in Japan and visited Canon and they loaned him a still camera with these lenses as he said he wanted to take pictures in Japan at night. When he returned to USA and had the pictures developed, he showed them Ed Di Glulio and it was decided have these lenses made for movie cameras. The 18 mm was originally T 2.8. Later Canon came out with a better T1.5 18 mm lens.

"The lenses had what we called piggy back mounts. They had BNCR lens mounts, and an Arri straight mount within. I also think some also had Arri Bayonet mounts. Terry Clairmont used the Canon K-35 zoom on a lot of commercials and with the macro feature would rack focus without having an image breathing during a focus change."

A Review of Canon Cine Lenses

Canon Chairman and CEO Fujio Mitarai presenting the EOS C300 at Paramount Studios with more motion picture products to come.

Masaya Maeda, Canon Managing Director in 2011, now President and Chief Operating Officer, at the Paramount launch of EOS C300.

Brief History of the Evolution of Cinema EOS Lenses

Canon launched Cinema EOS C300 Super35 cameras in November 2011 at Paramount Studios.

The cameras were available with EF or PL mounts.

Two new, high performance Super35 Studio Cine Zooms were also introduced. The Canon CN-E14.5–60mm T2.6 L S/SP and CN-E30–300mm T2.95–3.7 L S/SP came in EF or PL mounts. (Canon designates S for EF mount and SP for PL in the lens name.)

At the same time, Canon also introduced three cine style prime lenses. The CN-E24mm T1.5 L F, CN-E50mm T1.3 L F and CN-E85mm T1.3 L F came with EF mounts only. They covered Full Frame (36x24mm). This series of CN-E prime lenses grew to seven focal lengths in the ensuing years.

Nov. 2011: Canon EOS C300 with EF mount (left) and EOS C300 PL with PL mount (right)

2011:
14.5-60 mm T2.6 Zoom
Length: 12.52 in. / 318.0 mm
EF and PL Mount
Weight: 9.9 lb. / 4.5 kg
Front Diameter: Ø 136mm
Image circle: 29.6 mm

2011:
30-300 mm T2.95-3.7 Zoom
Length: 13.78 in. / 350.1mm
EF and PL Mount
Weight: 12.79 lb. / 5.8 kg
Front Diameter: Ø 136mm
Image circle: 29.6 mm

Nov. 2011: 24 mm T1.5, 50 mm T1.3, 85 mm T1.3 EF mount primes
Length: 4 in / 101.5mm average
Front Diameter: Ø 114mm
Weight: 2.6 lb / 1.2 kg average
Image circle: Full Frame

Set grows to 7 in the following years, adding: 14mm T3.1, 20mm T1.5, 35mm T1.5, 135mm T2.2. (CN-E14mm T3.1 L F, CN-E20mm T1.5 L F, CN-E35mm T1.5 L F, CN-E135mm T2.2)

At NAB 2012 a year later, Canon added two more Super35 Cine Zooms: CN-E15.5–47mm T2.8 L S/SP and CN-E30–105mm T2.8 L S/SP. These lightweight and compact zoom lenses were available in EF or PL mounts.

NAB 2014 brought Canon's popular CINE-SERVO 17-120mm T2.95-3.9 EF/PL zoom lens for Super35 cameras. It was wonderfully lightweight and small for a lens that could deliver such superb image quality over so much range. Its servo focus/iris/zoom handgrip detached with 3 screws. And it came in EF or PL mounts.

In October 2014, Canon introduced the remarkable CINE-SERVO 50-1000mm T5.0-8.9 (20:1) Ultra Telephoto Zoom Lens in PL or EF mount for Super35. A central design priority—dictated by the imperatives of natural history and documentary production—was to not exceed 15 lb weight and a length of 16 inches.

NAB 2016 saw yet more innovation with the debut of the new Compact Servo Zooms in EF mounts. Canon's COMPACT-SERVO 18-80mm T4.4 EF was a totally new hybrid, combining the best attributes of 3 kinds of Canon lenses: L-Series EF professional still photography lenses, Cinema Zooms with manual focus/iris/zoom barrels, and the CINE-SERVO.

Canon's Ryan Kamata said, "We saw a large gap between Cinema EOS lenses and EF Still Photography lenses, often 10 to 20 times: $40,000 cinema zooms on one end and $2,000 EF zooms on the other. It's unnatural to have so great a gap, like comparing a $40,000 sport bike to a $2,000 scooter. So we realized we needed something in between: affordable zoom lenses optimized for cine and video production."

"The concept of this new lens came after talking to users," Brent Ramsey, Technical Advisor at Canon said. "We noticed how many people were using EF mount still lenses on our Canon EOS C300, C100 and C500 cameras. They liked the fact that Canon offered more than 60 different EF still lenses. They liked the optical quality. "But they wished they could have a lens that did all that and also had the gears, smooth zoom, and manual iris of cinema lenses." Parfocal operation, minimum focus breathing, and built-in image stabilization were additional imperatives.

Almost like clockwork, a year later at NAB 2017, the Compact Servo family got a new sibling. The Canon COMPACT-SERVO 70-200mm T4.4 EF zoom covered longer focal lengths. And so, with just two lightweight, compact, affordable, high performance lenses, you could cover any angle from wide 18 mm to long 200

2012: 15.5-47 mm T2.8
Length: 8.4 in / 214 mm
EF and PL Mounts
Weight: 4.9lb / 2.2kg
Front Diameter: Ø 114 mm
Image circle: 29.6 mm

2012: 30-105 mm T2.8
Length: 8.3 in / 210 mm
EF and PL Mounts
Weight: 4.9lb / 2.2kg
Front Diameter: Ø 114 mm
Image circle: 29.6 mm

2014: 17-120 mm T2.9-3.9 Zoom
Length: 10.04 in. / 254.9 mm
EF and PL Mount
Weight: 9.9 lb. / 4.5 kg
Front Diameter: Ø 114mm
Image circle: 31.7 mm

2014: 50-1000 mm T5.0-8.9 Zoom
Length: 15.95 in. / 405.2 mm
EF and PL Mount
Weight: 14.55 lb / 6.6 kg
Front Diameter: Ø 136 mm
Image circle: 31.4 mm

2016: 18-80 T4.4 Zoom
Length: 7.2 in / 182.3 mm
EF Mount
Weight: 2.6 lb / 1.2 kg
Front Diameter: Ø 84 mm
Image circle: 31.4 mm

2017: 70-200 mm T4.4 Zoom
Length: 7.2 in / 182.3 mm
EF Mount
Weight: 2.76 lb / 1.25 kg
Front Diameter: Ø 84 mm
Image circle: 31.4 mm

2019: 14, 20, 24, 35, 50, 85, 135 mm Sumire Primes

mm. With constant aperture, this offers a cost-effective option to a set of maybe ten primes covering this total focal range.

But, as Oliver Twist said, "Please sir, we want more."

Cinematographers wanted more speed (wider apertures), more choices, more primes, and particularly PL primes.

Canon's Description of "More"

Canon's Senior Fellow Larry Thorpe explains, "It was a conscious decision at the outset for us to provide zooms with both PL and EF mounts, but to make our cine prime lenses in EF mount only. This was because there was already a substantial available inventory of PL primes from many manufacturers and we wanted to apply our resources to rapidly expanding a broad range of zoom lenses for both movie and television production.

"In the 8 years since we entered the cine arena, we learned a great deal from cinematographers as to what they wanted. We listened closely to camera crews and rental houses. We heard all of the discussions on digital resolutions as it marched to 4K and quite beyond. But, we also heard them talk about character, special personalities and unique characteristics, and of course, the vintage look.

"The recent move to Full Frame sensors has changed the landscape. And so, we figured it was time to think about what Canon might offer next with a new look in a set of prime lenses. And, with our very flexible family of S35 zoom lenses now well established we decided the time had come to offer more and marry the PL mount with new state of the art cine primes that might add a unique creativity to all of those wonderful new Full Frame digital cine cameras.

"Our new Sumire Primes are the results of those efforts.

"Although we might be considered 'the new kids on the block,' Canon does indeed have a long heritage in cinema optics and there is a great legacy of optical design for motion picture production.

Canon's Description of the Sumire "Look"

Larry Thorpe continues, "A central design priority of the Sumire Prime is to do justice to the remarkably high resolution capabilities of the Full Frame digital cine cameras presently in the marketplace. The new primes achieve the requisite sharpness in the central range of lens aperture settings. Lens resolution is bounded by diffraction as the lens aperture is stopped down and by the collective of the multiple optical aberrations as the aperture setting approaches wide open.

"Contemporary powerful computer simulation allows degrees of freedom in shaping these aberrations with a precision that allows the tailoring of different looks as the lens comes close to maximum relative aperture setting. The computer simulation facilitated exploration of the effect of this on the textural rendering of facial close-ups. That simulation further explored a range of faces that varied by age, gender, and ethnicity—ultimately allowing the optical designers to zero in on fine adjustments to the aberrations that created a gentle modulation of the lens sharpness that imparted a subtle and aesthetic nuance to a broad range of facial skins. It further imparted a smoothness to the transition between in focus and out of focus regions of a scene."

The Origins of Sumire and the "Look"

Yotaro (Jay) Sanjo, Imaging Technologies & Communications Group Professional Product Management at Canon USA said, "This is an important project for Canon. We usually don't give unique names to our products, but the Sumire Primes are different.

"I have been engaged in the optical design of Canon's cinema lenses after studying physics at university and graduate school in Japan. Utilizing the background of optical engineers who understand the optical technology that is the core at Canon and to maximize the value of Canon lenses while consolidating ideas for future Canon lens products, I came to the USA.

"Since launching Cinema EOS, we have received a lot of requests from the market asking for PL primes. Furthermore, one of our optical engineers got a good preliminary idea of the desired "look" after visiting a number of cine customers. He saw that 80% of the time, the scenes in most motion pictures and TV series involved people, faces and actors. This formed the basis of his technical understanding of how to accomplish the look. Subsequently, his team built a trial lens with the characteristic look and PL mount.

"Next, we visited many customers, showed the trial lens to various DPs and rental houses under NDA and received various opinions. While studying the cinema market, we repeatedly discussed what these lenses would be and how best to introduce them. Then, finally we were ready to announce Sumire Primes at NAB 2019.

"Canon has built trust through the technical achievements launched since Cinema EOS. On the other hand, we believe that further commitments to the market are required. Cinema users continue to have ever greater expectations and they would like to continue investing with peace of mind.

So, we would like to invite your readers to follow as you visit Utsunomiya, the base of Canon's optical technology, to show the efforts in our philosophy and the background of trust and achievement of our cinema lenses."

That tour follows on the next pages.

Canon's Utsunomiya Lens Factory

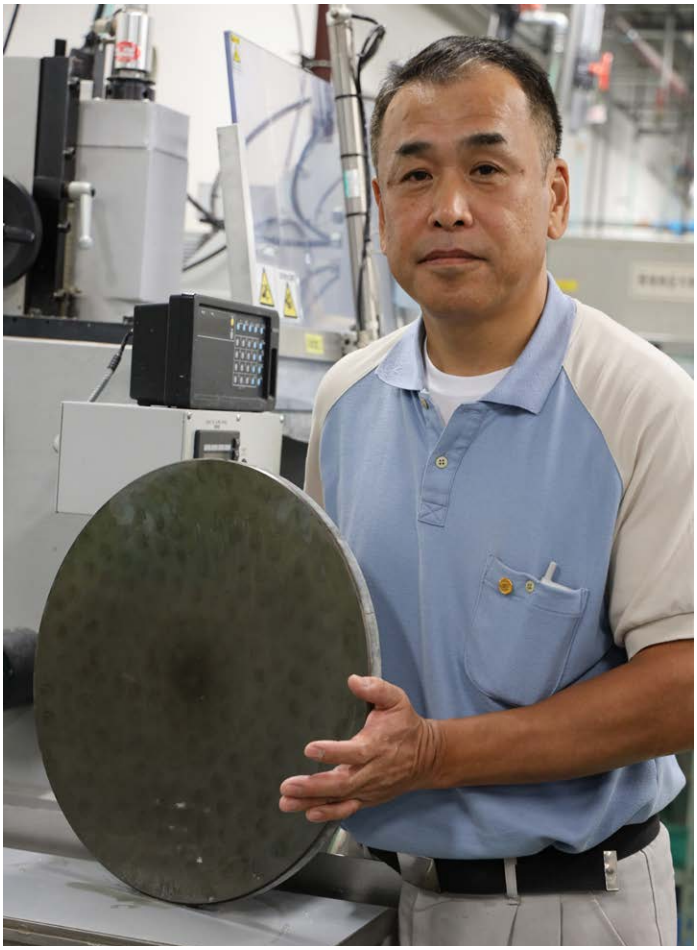
Canon's Utsunomiya Lens Factory. All photos in this article taken with an EOS R and RF 24-105mm F4 L IS USM. Below, the Sumire Prime Lens Team.

Larry Thorpe and Yotaro (Jay) Sanjo at Utsunomiya Station.

Kenichi Izuki, Utsunomiya Plant Manager

Kazuhiko Seki, Deputy Plant Manager

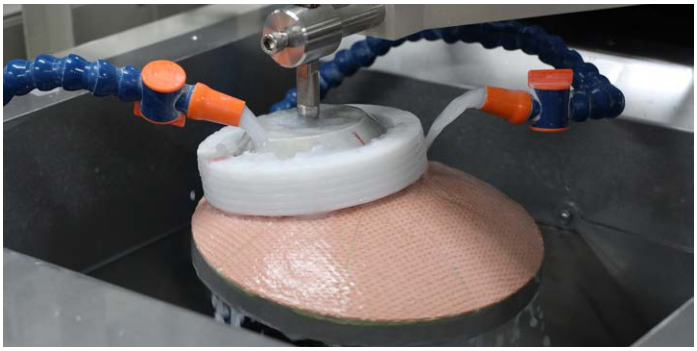
Display cases Utsunomiya Lens Factory lobby showing the stages of lens production.



Toshio Saito, Senior Architect for Lens Polishing

If we made this lens to a diameter of 300m, the precision of the curvature would be within 30 microns.

Above: Smoothing. Below, polishing.



Toshio Saito is a senior engineer, supervisor of the grinding and polishing department, and also is responsible for teaching his team. He describes the process:

"In the lens making, we start with the raw glass material. The rough grinding begins to give the lens its shape. It looks like cloudy glass at this stage.

"The next stage is called smoothing and we fine-grind the glass to a fine and clear finish. The plate that does the grinding is made up of many diamond pellets. The plate is sprayed with a liquid slurry. Canon lens precision standards are quite strict. For example, if we made this lens to a circular diameter of 300m, which is about the size of a soccer stadium, the precision of the curvature would be within 0.03 millimeters. That is thirty microns of deviation in nine hundred feet.

"Canon cine and broadcast lenses are made to a tolerance of 13 nanometers deviation. 1 nanometer is 1 billionth of a millimeter.

"To achieve this high level of accuracy, the entire process is important: the condition of the machines, the rotation ratio, the weight of the polishing plates, the temperature of the solutions and their mixture. All those things are necessary to achieve the precision of 13 nanometers deviation.

"Next comes centering. We define the optical axis of the lens. And this is one of the most difficult aspects of the process.

"After we design a new lens, the manufacturing process begins with a master lens. After the polishing has been completed, we make sure the master lens has achieved the curvature required. This is checked on the interferometer. If the lines are straight, we have high precision. If the lines are wavy, it would be out of tolerance."

Above: JF trying hand at smoothing. Below: checking with interferometer.

The 7 Steps of Lens Prep

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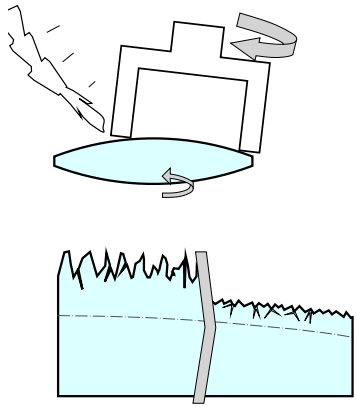

1. Rough Grinding.

To get the approximate shape of the lens element, raw glass material is ground with an abrasive.

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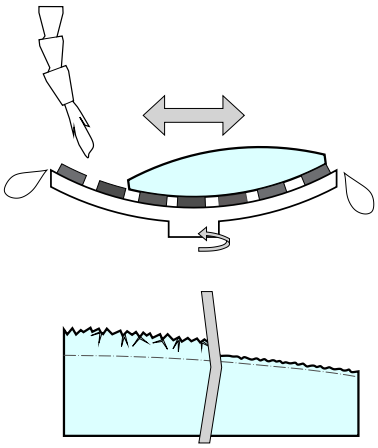

2. Smoothing.

The lens element is fine-ground with a diamond pellet tool and the lens takes on its final curvature shape. The lenses still look cloudy.

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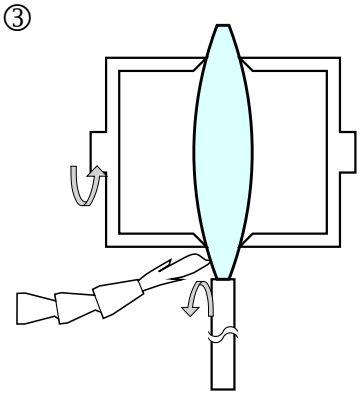

3. Centering.

The optical center of the lens is measured. Then, the optimal distance to the outer edge is calculated. Since it's a circle, every point around the circumference must be exactly the same distance to the center. And so, a precision grindstone shapes the outer edge.

Illustrations by Marlena Fauer

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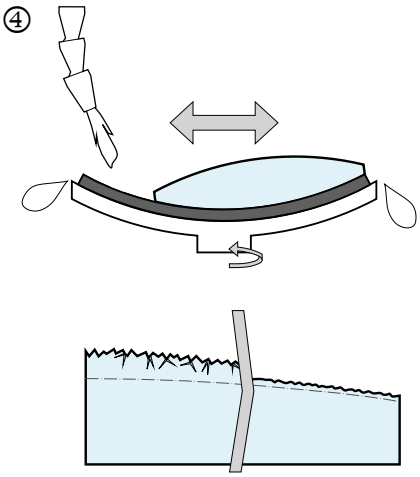

4. Polishing.

Lenses are polished with polyurethane pellets and an abrasive slurry until they become transparent. High performance cine lenses are polished to 1 nanometer (1 billionth of a millimeter) accuracy.

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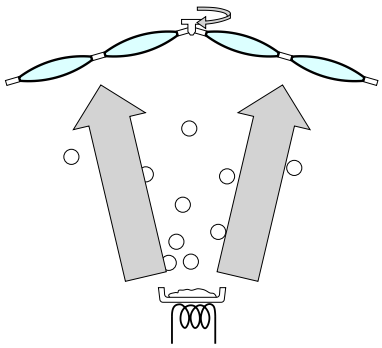

5. Coating.

Inside a vacuum chamber, a thin chemical-mineral film is evaporated and deposited onto each lens element. This reduces surface reflections and improves transmission of light.

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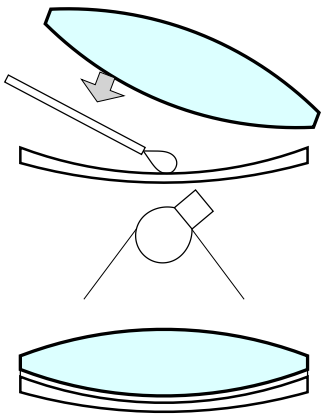

6. Cementing.

Two optical elements, often made of different kinds of glass, can be joined together with a resin adhesive. It is hardened and cured with UV light.

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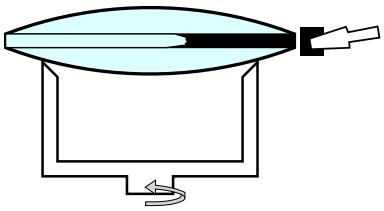
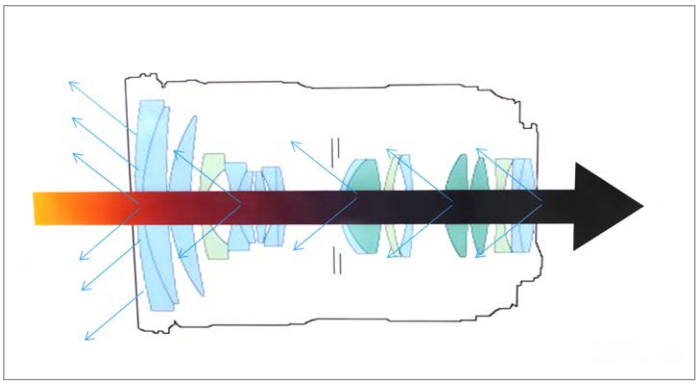


7. Edge Painting.

To eliminate reflections between the edge of the element and the lens barrel to which it's mounted, the circumference is painted by hand with a special, deep-black paint.

Coating, Cleaning, Assembly

Coating



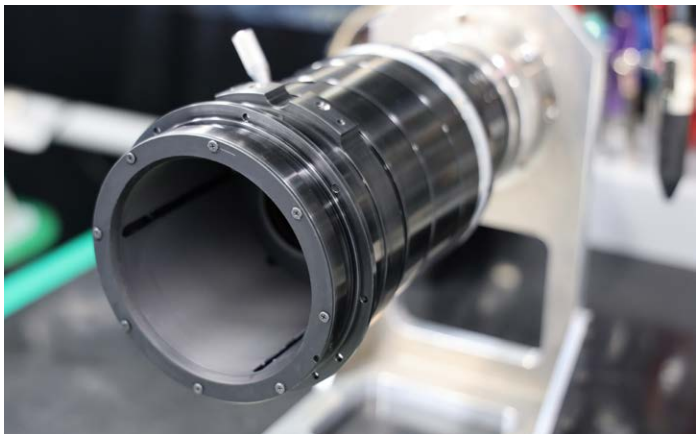
If a lens has 5 optical elements inside–that would be 10 refractive surfaces–each losing 5% of the light. A 5-element 50 mm f/2.8 lens might lose more than 50% of the light, giving you a stop of T3.8. Now, consider that many modern cine primes and zooms have 18 or more elements, as shown above.

Yasuyuki Tomita, Deputy Senior Manager (Chief Optical Designer) at a vacuum coating machine. Basically, a substance, often an exotic metal, is heated and vaporized in a vacuum chamber and the particles are deposited onto both surfaces of the optical elements.

Cleaning

Optical elements are checked under two kinds of light sources for cleanliness: a projector (parallel beams) and a table lamp (scattered light).

Lens Assembly



Hideki Tachibana, Manager of the Super-High Precision Lens Assembly Area.

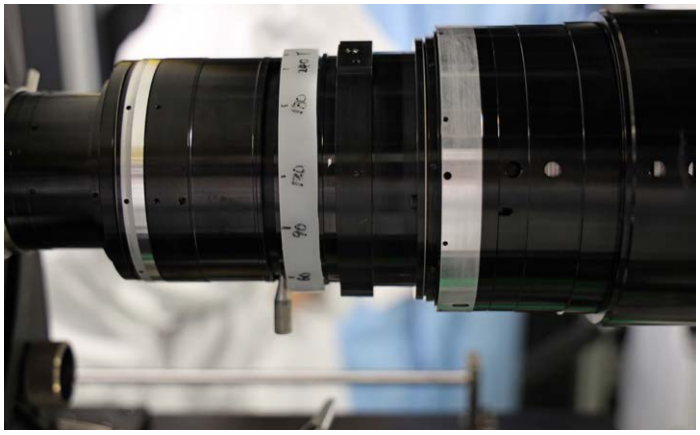
Mr. Hideki Tachibana is a section manager at Utsunomiya. Here, he is assembling a Canon 30-300mm cinema zoom lens. He explained, "Assembly is a very delicate process. We have Lens Meisters who are accredited to work at the highest level. All the team members in this department are Meisters. For example, here the 30-300mm zoom is in the process of its mid stage assembly. One person will do the whole assembly. This is the mechanical zoom section. The barrel is checked to be sure the zoom sections travel smoothly without any rough spots. Next comes optical assembly and adjustment."

Optical Assembly

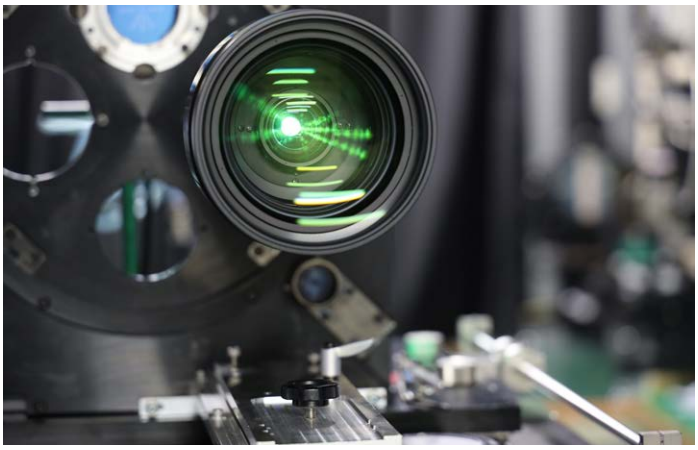
Assembling the optical elements inside the lens barrel.

Optical assembly involves mounting the lens modules inside the barrel. All the lens rings are pre-engraved: focus, iris and zoom. The infinity position is set, and all the other marks "fall into place." This is different from other companies who calibrate each lens individually or who have an assortment of barrels from which to choose. At Canon, the barrels are all the same, and any adjustments are performed accordingly.

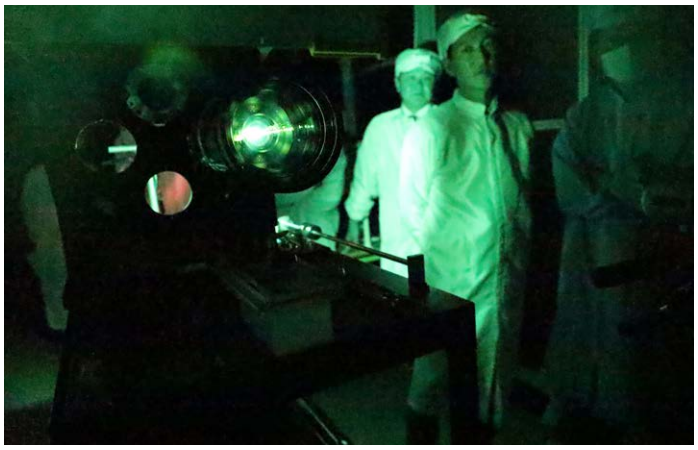
The lens is checked on the lens test projector several times (below) and fine-tuned as needed. Adjustments include center axis, contrast, peripheral blur, etc. Aperture and T-stop settings are checked at another station. Torque of the barrels is also checked.



Testing



Testing on the lens projector. Turret with multiple reticles and lens mounts.



Shot with Canon EOS R and RF 24-105mm F4 L IS USM at 102,400 ISO.

Ready

Completed Sumire Primes

Over Bento Box lunch and long into the afternoon, executives and engineers at Canon's Utsunomiya Lens Plant were generous with their time and knowledge to discuss optics, lens design, look, technology, art and Sumire Primes.

Cast of Characters in the discussion that follows:
Lawrence J. Thorpe, Canon Senior Fellow (in pink shirt, above);
Yotaro (Jay) Sanjo (to the right of Larry Thorpe),
Product Manager, Cine lenses, Canon U.S.A., Inc.

Ryuji Nurishi, General Manager, Optical Design Division (above, L to R);
Kazumasa Yoshikawa, Senior General Manager, Image Solutions Business Promotion Center 21;
Tetsushi Hibi (center—the boss), Senior General Manager, Canon Optics R&D Center;
Yasuyuki Tomita, Deputy Senior General Manager (Chief Optical Designer), Canon Optics R&D Center;
Takeshi Idemura, General Manager, Mechanical Design Division.

JON FAUER: A physicist said that lens design is like searching for the solution to a problem where you don't even know if there is a solution. Would you agree or say it differently?

RYUJI NURISHI: It's a very philosophical question. There are some aspects that I don't quite agree with, if I may elaborate. As an optical designer, when you join Canon, you are given a book. We call it the bible. It is called "Lens Design Method: How To Design Lenses." When I read this book, I learned that any question you might have about lens design always has a solution. But having said that, this bible basically explains that there are different ways to address each problem. In other words, different approaches would require different questions and would end up with different outcomes. So, as an optical designer, I can understand the question. But for us, at Canon, we work under the assumption that there is a solution.

YASUYUKI TOMITA: Another way to put it is that there is usually an answer to a problem. But for me, optical design is almost like painting a picture. There's no right answer. There's no right way. Different people take different approaches as to how they might interpret a subject and how they would express themselves in creating a painting.

There are different ways to approach lens design. Certainly, if you translate it to the cine lens industry, it's about the different philosophies of the various companies. Different people have different ways of designing and creating.

JON FAUER: Would you say that lens design is more an art or more a science?

YASUYUKI TOMITA: My personal opinion, if I may? I think half and half. Half art. Half science.

RYUJI NURISHI: Both are essential: art and science in lens design. I think it's really about pursuing a level in the design and also the "Monodzukuri" (the way of making things) that can take it to a higher level. That involves the aspects of science.

It is half art, half science. Both are essential in lens design as well as "Monodzukuri," the way of making things.

High technology is required but there's also a great degree of craft, art and artisanship. It's about the nuances, the instincts that people have, and combining all those things together. You have the latest technology but are always pursuing an ideal level, if you will. So, I think that's why both sides are important.

YASUYUKI TOMITA: I said half and half because even when you try to pursue one aspect of lens design, for example the artistic side, if the DP can't interpret that possibility and use it to the maximum, then it will be useless. I think the same can be said for the technology side, the science side. Even if we pursue the best technology in a lens, if the person who uses it, the DP for example, does not appreciate it and cannot bring out the best in it, then our efforts will be meaningless. So, that's why you have to have a good balance of both.

TAKESHI IDEMURA: I think each of the elements are part of the the optical and the mechanical science. But each element, when combined, contributes to where the art comes in. How you combine them, how you bring out the best performance—are both essential. I think that truly defines the concept of our company, of Canon, and what the company stands for.

JON FAUER: Where does the idea for a new lens come from? Does it come from you and the fact that you want to introduce something? Does it come from input from the market? Does it come from the customers?

KAZUMASA YOSHIKAWA: The concept originates with the cinematographers and what they look for in their visual expressions. I don't think any single lens can satisfy all their demands.

Yasuyuki Tomita, Deputy Senior General Manager (Chief Optical Designer).

Kazumasa Yoshikawa, Senior General Manager.

Because it comes down to the discussion we were having earlier about the look. It's about what look are you seeking in a particular project. We speak to a lot of cinematographers from the US, Europe and Japan to understand what they're looking for. From those requests, we will listen and determine the requirements to create a new lens.

At the same time, ideas are always brewing inside Canon. We call them the three "C's." Canon, Concept, Create. We feed all those ideas into the mix and create the final product.

JON FAUER: How much design comes from customer requests?

TETSUSHI HIBI: It depends on the product. Some of the ideas come from the "C's," internally. The Sumire Prime cinema lens that you saw today came about because we are at NAB every year. We talked to the DPs, listened to what they were asking for, and learned about the look they were looking for. And so, we created these new Sumire Primes.

JON FAUER: But is it true that if you talk to 20 DPs, you'll get 20 different opinions? How do you balance that?

TETSUSHI HIBI: We give it to Larry Thorpe to decide [laughs].

LARRY THORPE: I would suggest that you do get 20 different answers but you can find common threads. Each cinematographer uses a different vocabulary. One will talk about the personality of a lens. Another will say another word and you try to whittle that down. And then it sometimes becomes clear that they are really talking about the same thing.

JON FAUER: Isn't it somewhat like a horse whisperer. You're the lens whisperer who translates DP speak into lens design terminology. Who does that?

RYUJI NURISHI: Mr. Jay Sanjo! Sanjo-san formerly worked for me so he can do the translations very nicely. He knows how to interpret the languages of the DPs into terms that we can understand.

JAY SANJO: I conduct lens projection tests with the Rental Houses. Also, I spend time on sets and locations with Cinematographers and Camera Crews to see the actual production situations. Then, I translate their technical or artistic words and try to summarize what kind of lenses the Cinema Market desires. That's my job.

JON FAUER: Does someone do "DP translations" here in Japan and others get feedback in Europe, the Americas and elsewhere?

TESTSUSHI HIBI: We have team members in Europe as well as in Japan who speak to the customers, to the users, to really understand what they're looking for. That information gets fed to us along with the business and development teams. Together, we have discussions to see how viable that information is and based on that, we decide what sort of lens we should be creating and then the plan comes together.

JON FAUER: Were the new Sumire Primes a result of your hearing comments from DPs?

YOSHIKAWA KAZUMASA: Yes, both Larry-san and Sanjo-san interpreted a lot of information for us. Also, I was in the US in July of last year. We spoke to a lot of DPs. Nuri-san also went to Europe last year in March. We based our designs on all that information.

JON FAUER: And what did DPs tell you that they wanted in these lenses?

RYUJI NURISHI: Creamy. Organic. Pleasing skin tones. But sharp for the eyelashes and hair. Gentle focus fall-off. Beautiful bokeh.

JON FAUER: What does it mean to a lens designer when a DP says, "I would like a vintage, old-fashioned look?"

RYUJI NURISHI: As optical designers, we always try to pursue the finest, the best and sharpest. Talking about a vintage look is a different concept. The notion of "vintage" would vary depending on the individual speaking, because we all have different interpretations of what that means. 20 DPs will have 20 different definitions of "vintage."

In the days when we used film, DPs would normally say, "If I use this film and this lens, this is the kind of look that I will get" and they had an idea of what kind of lens to use. But in this digital age, any lens would probably give you a certain level of look. And therein lies the problem. Depending on the person who is actually doing the shooting, what they're looking for in expression varies because of what they want to create. The picture varies. So, as a lens maker, we were always providing lenses that possessed the finest line pair resolution—the finite, if you will. That is what we were actually creating and putting on the market.

But depending on what brush you use, and I'm talking about

Ryuji Nurishi with the Canon Optical Design Bible: "Lens Design Method: How To Design Lenses."

Takeshi Idemura with historic blueprints of early Canon designs.

the finite, how thick is it, how big? The brush, the lens, actually changes the expression of the art and that's what the DPs are looking for: different types of expression, depending on the paintbrush that they would use.

The Sumire Prime that you saw here was designed for the purpose of creating the best way to represent, to film, a human being. That's the paint brush. The Sumire is for the human face.

JON FAUER: A set of lenses specializing in portraits is very interesting. So, if a DP asks you, "I want a lens that's sharp for the hair but creamy for the face," how do you translate that into optical formulas?

RYUJI NURISHI: To create that look, imagine creating creamy skin tones with sharp eyelash detail in all seven focal lengths that we will be launching. That's the art and science of what Canon does. The know-how.

JON FAUER: The secret sauce. In designing lenses, do you also go to the movies, take pictures, go to art museums? Does that influence you visually?

TAKESHI IDEMURA: Originally, taking family photos and pictures of children had a big influence on our work. But when we started designing the Cinema EOS lenses around 2011, I think we began to see movies differently. I see a lot more films. That changed my way of thinking.

YASUYUKI TOMITA

My parents were avid still photographers. They liked cameras to begin with, so I grew up with cameras in the house.

JON FAUER: Hopefully, Canon cameras.

YASUYUKI TOMITA: From junior high school, I started taking pictures myself. Photography was a part of my life. The reason I studied physics in university was because I wanted to learn about optical design. In other words, I always wanted to be an optical designer. I love going to art museums and I really liked your articles about Renoir. It was inspiring.

JON FAUER: Oh, thank you. The new Sumire Prime lenses seem to be different from any Canon cine lens I've seen before. Can you please tell us how and why you achieved that?

RYUJI NURISHI: I guess the greatest feature is the different approach to sharpness and contrast that we have achieved in these lenses. But it was a long road coming to these decisions and building the first prototypes. It actually takes us back 15 years ago when there was a demand for greater sharpness and contrast. This was in the early days of digital, before HD cameras, when we developed the FJ series of lenses. They had great sharpness, high resolution and high contrast. And no aberrations. But everybody hated them.

JON FAUER: Why?

RYUJI NURISHI: Because you had just one point of focus. The out of focus areas just dropped off. It was not smooth. And the color was too blue. It was not just because of the lens, but also the projector. TV was 30 frames per second and film projection was 24 fps. But when we saw the actual film being projected, it wasn't natural. That's when we realized there are different requirements for film and TV. In a cinema, people watch a large screen in a really dark place. Their ways of absorbing and interpreting information are different than viewing something in daylight. In a dark place, you interpret blue as a darker blue and don't interpret red as strongly as you would in the daylight. It is called the Purkinje effect.

When we interpret this technically, it's about the need for a warmer color balance when viewing the image in a dark place. When we started to think about what kind of lens is required in a cinema setting, that is why our EF cinema lenses have a warm color balance. That's uniquely different from our standard EF still photography lenses. Our still lenses are more neutral than cinema lenses.

JON FAUER: What happens when we are viewing a movie on a small tablet?

RYUJI NURISHI: Normally, people use their tablets in a brighter place. And you might think that you'd want a more neutral balance. But there is a certain cinematic color balance that we've become accustomed to over many years of watching films. This is the kind of color balance we expect to see in a film. It might feel more cinematic even when you watch it in the different formats or screens.

JON FAUER: When you had the idea that DPs would like something with a little more character, a little smoother, what was the next step?

TETSUSHI HIBI: We started with an overview of the project plan. We defined what kind of performance we needed to look

for, the texture, the size of the lens, the material and the cost. All those things were defined up front. Once we had that, we formed a development team consisting of all the departments that would be required. The optical people started on the design first. Then the mechanical team and the styling teams joined in.

Normally, we would go straight to the prototyping. But because the simulation technology is now quite advanced, it allows us to do the simulations before we get into to the actual creation of the prototype. We can assess what changes are required on the optical and mechanical side of things. Then we can go into the final prototype development.

JON FAUER: What simulations can you do?

RYUJI NURISHI: We can simulate ghosting, MTF, bokeh and flares. But in terms of actual skin tones and sharpness of the hair, we need to have the DPs look at our tests and discuss their impressions. In terms of being able to simulate bokeh, I would say that we might be quite advanced in that field compared to the rest of the industry. Our optical simulation software is not bought off the shelf. We actually design the optical simulation software ourselves. For example, our ghosting simulations compare very favorably to real lens tests. We also can simulate the lens being dropped.

JON FAUER: Your new Sumire Primes appear to be smaller than some other cine lenses. Is this a function of the design or did you decide in the beginning that it would have to be small?

RYUJI NURISHI: It is thanks to the Canon Lens Design Method book. That taught me. [Laugh.]

JON FAUER: It's in the book.

RYUJI NURISHI: We also keep the blueprints and archives of all our previous lenses. Some of these archives go back many years. And that's why we can always build upon this history. But we all started from this bible. And that spirit remains in us. You could buy it at a bookstore.

It was the first book that was published about systematically designing, understanding and correcting optical aberrations. A great thing is at the very end: it tells you how to work. It even explains how to officially draft a blueprint. In some ways, it can be a message for any kind of work. It's very philosophical in that regard.

JON FAUER: After you have the prototype, do you shoot real images and study them?

TAKESHI IDEMURA: We also have a team dedicated to the assessment and inspection of the prototypes. We work with them.

JON FAUER: Who decides what the bokeh should look like or is there a section in the Canon book that describes that bokeh should look a certain way?

TAKESHI IDEMURA: Basically, during the design stage, we have a certain style of bokeh that we want to have. But during the simulation stage, we look at what kind of bokeh we can achieve. The assessment team comes in afterwards and checks whether we've accomplished that or not. But, even before prototyping, during the simulation stage, we have the bosses come in to assess and say, "This is a good bokeh. This is not a good one." They have their sign off on it.

Crafting Canon Lenses

L-R: Toshio Saito; Mitsuharu Umei, Hideki Tachibana, Kenichi Izuki.
Toshio Saito, Meishō;
Mitsuharu Umei, Lens Meister;
Hideki Tachibana, Manager of Super-High Precision Lens Assembly Area;
Kenichi Izuki, Utsunomiya Plant Manger

At this point, the craftsmen who put Canon lenses together discussed their work. The designers listened and sometimes chimed in.

JON FAUER: Please explain the process of manufacturing a cine lens at the Canon Utsunomiya Factory.

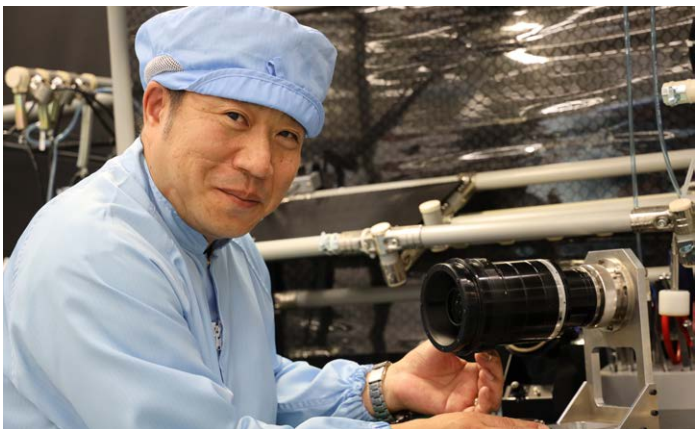
TOSHIO SAITO: We begin by purchasing the actual glass elements to start the process. After that, we go through the various stages: grinding, smoothing, centering, and polishing. Next, there's the inspection stage to make sure that we have the quality that we're looking for and once that's confirmed, we take it to the coating area. Then we do the blacking around the edges and clean the optical elements. We then put the glass elements into the mechanical, metal barrels. We use aluminum, magnesium and other materials for the housings and exterior part of the lens.

JON FAUER: How do you craft a lens barrel?

KENICHI IZUKI: Often, three or four machines are involved. We first wash the parts that we have machined. Usually it's aluminum, magnesium or other materials. Let's say we're using aluminum material this time. We would use Allumite which hardens and blackens on the outside. After that, we go through a painting stage.

HIDEKI TACHIBANA: Once we have all the parts that are created out of metal, they are delivered to our assembly section. They are delivered as units, or modules: so we have the zoom units, focus units, and we would do that assembling separately. This unit assembling stage is not a simple matter of just putting the parts together. It's about making sure all the parts function properly to the point that we can see that precision of the final product. So, we would have inspections for each step along the way. Then we create what's called a lens unit. So, in a zoom lens, we have the focus group, the variator group, the compensator group and the rear group.

We also have inspection stages for the lens assembly as well. There are specifications stated for each of the steps. Next the optical groups are docked into the mechanical lens barrel. At this point, once again, we have inspection, centering, axis correction, and so on. Next, we do the additional optical adjustments, do the final MTF inspection and QC the entire final product.



Hideki Tachibana, Manager of Super-High Precision Lens Assembly

Kenji Namiki, Director of Pro Product Business Planning, Canon USA.

JON FAUER: Which has been the most difficult cine lens to build?

HIDEKI TACHIBANA: The Canon CINE-SERVO 50-1000mm T5.0-8.9 EF 20x zoom lens..

JON FAUER: Why is it so difficult?

HIDEKI TACHIBANA: Because of the 20 times zoom ratio, all the parts have to work properly and adjust together to make sure that we can actually have the smooth zoom movement. The complexity is in assembling those parts.

JON FAUER: About how long does it take to build, from start to finish, for example, the 30-300mm zoom that we saw today?

KENICHI IZUKI: Without being too specific, about a month, including the machining of the metal parts. The actual assembly that we saw in the assembly room takes approximately 10 days.

JON FAUER: And one Lens Meister does the whole thing?

HIDEKI TACHIBANA: A Lens Meister can do the entire process, but they also train other people to make sure that they can do the assembling themselves as well. In other words, a number of people work on one lens together. It's a process developed in Japan called "Just in time" or cell-based production.

We create all the parts required and they are delivered directly to the assembly section. All the things you need are in a big wagon. Somebody rolls the wagon in with all the parts. And that's where they start to do the work. The process for cine lenses is different than for consumer lenses. That is a mass production system.

JON FAUER: What happens during the manufacturing process of a cine lens if a Lens Meister or member of the assembly team has an idea on improving the way something is done? For example, what if they think that by moving a screw, it would be a lot easier to build the lens?

KENICHI IZUKI: We actually have this thing called the "Kaizen Process," "Improvement Process." If an idea comes up, there is a form that you can fill and that gets sent to his or her senior and they can discuss it with the sections or divisions to see whether it can be adoped or not. So, there's a whole process in place.

JON FAUER: Does that happen often?

KENICHI IZUKI: Every day.

JON FAUER: Do you have a goal of how many lenses you hope to build in a given time and whether that is achieved?

KENICHI IZUKI: Yes. We have a strict production plan that outlines how many units we are going to create in a month.

JON FAUER: Please take us through the process again of how the lens is tested, adjusted, and then finally inspected?

HIDEKI TACHIBANA: There are many lens elements that we work with. When we build lenses, there are unique specifications to each group. In other words, how they work best together is what we actually first assess. Another adjustment we will do is the spacing between the elements—the air gap—to make sure that we have the correct distance between them.

JON FAUER: We talked about this earlier, but how is it that Canon is so precise, there's not that much adjustment to be done for focus and distance?

HIDEKI TACHIBANA: Initially we weren't that different from others. In other words, we did take a lot of time at that final stage of readjustment. But, realizing that we should shorten the time of actually doing those adjustments, we analyzed the process to make sure we could achieve the level precision required to save us time at the final stages of the assembly. These are improvements we have made over the years.

LARRY THORPE: It was an evolution.

KENICHI IZUKI: We did have a phase where we assembled, disassembled, assembled again, and it took much longer. Now we can do it faster and deliver more lenses on time.

JON FAUER: I noticed that a lot of your zooms have cams. And the prime lenses have helical threads. How do you decide which system to use?

YASUYUKI TOMITA: We choose to use a helical design when the travel is linear, and we use cams when it is non-linear. For example, to maintain equal distance between markings of T-Stops we use a cam because the iris is non-linear.

LARRY THORPE: I've always been puzzled that we publish the resolution of our still photography EF lenses—meridional, tangential and, sagittal. We've never published anything like that for cine lens. Nobody does, no manufacturer. But do we measure sagittal and meridional in the adjustment of the cine lenses?

YASUYUKI TOMITA: We do the measurements in-house, certainly. But that knowledge is not even shared within Canon. It's

just for the limited number of people who are part of the design teams. My take is that for consumer lenses, many users will do their own measurements anyway. By publishing the numbers, we say that we can guarantee these numbers. But with cinema lenses, those numbers are not made public.

LARRY THORPE: Interesting.

JON FAUER: Let's say you have built the prototype of a lens. Does manufacturing have input whether it's practical to build that prototype in a certain way? And who decides how to build the actual lens?

YASUYUKI TOMITA: Yes, we have a number of discussions where the manufacturing teams will come in for meetings with the designers to sit down and discuss the best way, the direction in terms of the process.

JON FAUER: Do you have a test manufacturing area where you figure out how to manufacture it?

YASUYUKI TOMITA: Yes, we have a facility dedicated to creating test runs.

JON FAUER: Do some of your cine lenses use aspheric elements? I assume those are polished here using sophisticated Magnetorheological Finishing (MRF) machines. Where and how is that done?

YASUYUKI TOMITA: We finish the aspherical lens elements here, but we actually use our own in-house machines that are unique to Canon.

LARRY THORPE: To summarize the process, the picture I have in my head is: create the design and then make a prototype. Do the design engineers make the prototype?

YASUYUKI TOMITA

There's a specialist team of designers dedicated to the process of making the prototypes.

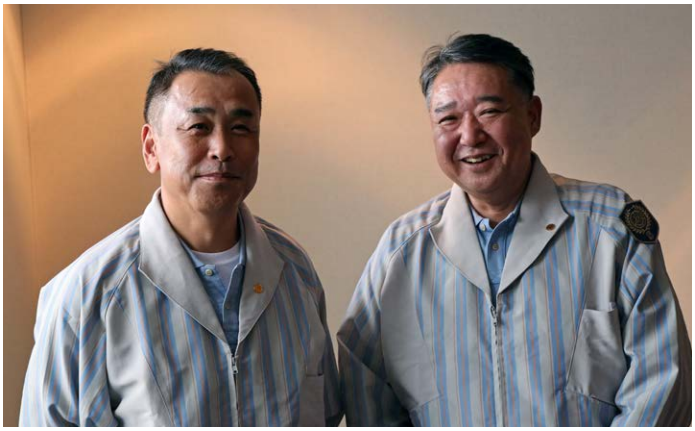
LARRY THORPE: And then, the next step is to discuss how the prototype is working and engage manufacturing about the process of building it. Step one is design, step two is prototype, step three is manufacturing.

YASUYUKI TOMITA: Actually, the manufacturing team gets involved from stage one, in the design phase. And throughout the process, all the teams are involved and provide input.

LARRY THORPE: The reason I asked the question was maybe one or two years ago, I read an interview with the manager of the design team for the Canon 50-1000 zoom. He explained that because they were pushing the state of the art in design to make this incredible 20x zoom, there was intense discussion between the manufacturing and the design teams. I just wondered if that is the way it is with all lenses and I think I hear yes.

YASUYUKI TOMITA: The manufacturing team always has their requests about what seems appropriate, but at the same time the designers will also have their own requests. The discussions usually revolved around things that did not exist before, things that used to be impossible. The questions are, "Can you actually create this? Can you actually build this?" They would have the request and then there's the challenge that the manufacturer will get and we'll try to respond to it.

Canon Lens Meishō & Meister



L-R: Toshio Saito (Meishō) and Mitsuharu Umei (Lens Meister).

JON FAUER: Because we have the privilege of talking with the two Meisters here in the room today, may I ask some additional questions?

KENJI NAMIKI: I think it would be of beneficial for all of us because at Canon it's very important that we pass along the expertise and technique from our Meisters and ensure it continues to be taught to [future] team members.

JON FAUER: Please tell us what is a "Meister" and how do you become a "Meister?"

TOSHIO SAITO: To give you a bit of my background, since joining Canon I've been involved in all sorts of lens polishing and finishing. I've had many challenges across my desk asking, "Can you create a lens to this precision?" And I've been able to respond to that. Through those years of challenges and development, the contributions I've made thankfully were acknowledged and accredited with this title of Meister (Japanese: "Meishō").

Not so much these days, but in the past I've had days where I would stay here until midnight because the polishing was just so impossible and I had this challenge in front of me, but I had to tackle it and I would spend hours and hours until I could get it to the right polishing stage.

It's about texture, instinct, what you feel when you actually touch and get the sense of the glass.

JON FAUER: It's stressful?

TOSHIO SAITO: It comes down to whether you like the job and I love it. I have a passion for polishing lenses. There is a great sense of achievement that I get when I actually achieve that level of precision and hear comments like, "Oh, you know Saito-san's lens? This is the precision I wanted. This is what we were looking for. Thank you." Those comments have motivated me over the years.

JON FAUER: How did you start? How did you learn?

TOSHIO SAITO: From the day when I joined Canon, I was in the grinding and polishing section. But, back then, my seniors, the people who were supposed to teach me, didn't have so many words to say. So, I had to learn what they were doing by watching

their technique—to learn by observing rather than by being told what to do. I spent many years doing that.

JON FAUER: And Mr. Umei?

MITSUHARU UMEI: I was actually an apprentice to Saito Meishō, and still work under his guidance. Since joining the lens department, I also learned from my seniors and tried to follow their instructions to the letter to make sure that I got the point. I tried to replicate what I was being told. I spent many years doing that and after 10 years, it came to a point where I developed my own skills. I then got involved in the mass production side. In other words, when a prototype came in, I would do the assessment to make sure that we could manufacture it to the level that was required for this prototype to go into mass production.

That's how I moved up in my divisions. Obviously difficult lenses would come in and I would have those challenges I would tackle. I've actually been accredited as a lens polishing Meister, but I actually oversee the entire four processes that we talked about earlier. But being Saito-san's apprentice, I'm literally learning from him as to what we need to be looking for, the standards that are required. He's old-school as well. He doesn't speak much. But the words he does say and the things that he tells me, I follow to the letter. Also, I have to continue to learn to make sure that I can achieve the various goals.

It's about texture, it's about instinct, it's about what you feel when you actually touch and get the sense of the glass. I'm trying to develop that within myself to the level of Saito-san, and I'm still learning.

JON FAUER: Who decides if somebody is a Meister? Is there a school or a test?

MITSUHARU UMEI: First of all, there's a national accreditation process that you have to satisfy.

That's the first stage of becoming a Meister.

Once you have this national accreditation, a license so to speak, there is a committee inside Canon. There's a company-wide committee that assesses you for a whole year. They watch what you can do and to what degree. They have discussions to make sure, and finally after that year, if you are worthy, you receive the title of a Meister.

JON FAUER: How many years did it take to become a Meister?

MITSUHARU UMEI: Too long to remember [laughs]. It's not the actual number of years that deem you qualified to become a Meister. For Saito-san, it took about 20 years. For me as well. But, you know, even though people may spend 20 years, you still need to have that instinct. You need to have the touch.

JON FAUER: True artisans. It's interesting that the word "Meister" is German. There seem to be a number of German words in the Japanese language, like "arubaito" from "Arbeit" which now means part-time job, or "Messe" for the convention hall we will be visiting tomorrow in Makuhari.

LARRY THORPE: I have another question. If the design team conjures up a new aspheric, do you gentlemen have to work out how to build it? Do you work out the polishing that can implement that new shape?

TOSHIO SAITO: When the design team comes up with the blueprint of a new aspherical lens, for example, they will first give it to me and the first assessment is whether it's possible or impossible, but I personally don't like to say it's not possible.

LARRY THORPE: You can try.

MITSUHARU UMEI: But, when you bring the blueprint for a high-end lens to Saito-san, you will get the lens that you designed. He's actually involved in creating special devices to do the grinding and the polishing.

JON FAUER: It's interesting that your jobs are somewhat similar to being a cinematographer. Many of us also learned as apprentices and the people who taught us didn't talk very much. You had to watch and it also could take 10 to 20 years until you were recognized. The two jobs seem similar.

KENICHI IZUKI: In the lens processing department, there are several hundred people working there, but you're seeing number one and number two in this room. In other words, not everybody can rise to this level. You have to have that instinct. You have to have that craftsmanship, that artisanship in order to achieve this degree of perfection.

JON FAUER: Bravo.

Full Frame 50mm T1.3 and 35mm T1.5 Sumire Primes on Canon EOS C700 FF PL.

Was this an ultimate test of our NDA, as Sanjo-san jokingly suggested? After all, I had sworn secrecy about Sumire, surrendered the SD card with all my EOS R photos, and relinquished final cut on all interviews. It was dinner time. We entered Asuka restaurant in Utsunomiya. There was a large pool by the entrance. Scarily swimming inside were Japanese Fugu, the notorious blowfish. I half-expected to hear Hibi-san imitate Ernst Stavro Blofeld, shark tank villain of the *Bond* films, with, "Good evening, Mr. Fauer."

Dining With Death—Fugu, the ominous article by Carey Jones, came to mind: "There may be no more notorious dish in the world than the Japanese Fugu, and for good reason. Their skin and organs carry an extremely potent poison called tetrodotoxin, a neurotoxin fatal to humans and other predators at very low doses. And if prepared improperly, yes, it can kill you. Fugu poisoning isn't a pleasant way to go. One thousand times more potent than cyanide, the lips and tongue grow numb first, followed by full-body weakness, seizures, and coma."

Fear was quickly dispelled over the assurances that they hadn't lost a customer yet and bottomless glasses of Junmai Daiginjo (I think it was Dassai 23.) Hibi-san explained that enjoying Fugu was common in Japan and you are at greater risk eating raw oysters in Los Angeles. Fugu chefs undergo years of training and must pass rigorous exams. I think becoming a Lens Meister might be tougher.

The Fugu was served over ice as paper-thin sashimi. It was almost transparent. The delicate, slightly sweet flavor was enhanced with shredded cucumber, wasabi and dipping sauces. Was that a slight tingling on my tongue, a numbness of the lips? No. It was delicious. The NDA endured and I would survive to write this article.
Tabelog details on Asuka Restaurant: tiny.cc/asuka

A couple of months after the Utsunomiya visit and Fugu adventure, in early March 2019, Canon's Yasuyuki Tomita (above), Jay Sanjo (below), Rob Luckett and Joe Poch came by with production models of Sumire Primes to test on a C700 FF and Canon EOS R fitted with a Wooden Camera RF to PL mount.

It was lunchtime. We packed cameras and lenses into backpacks to test them at T1.3 in the soft northwest light filtering through tall picture windows at Flora Bar a few blocks away in the Met Breuer Museum. Chef Ignacio Mattos presides. He was awarded America's Chef of the Year in 2017 by Esquire. The New York Times named Flora Bar one of the city's best new restaurants. Born in Uruguay, Mattos cooked for Argentinian grill meister Francis Mallmann. That's reason enough to focus on the amazing Wagyu beef burger with pepper marmalade and Taleggio. But first, start with the sea urchin and red shrimp resting on a single strip of nori. Share plates of Jamón Ibérico de Bellota and marinated olives. Mattos' style is to use beautiful, honest ingredients at their prime.

Primes—the new Sumire Primes from Canon—were beautiful and honest as well. Their style is something different: creating beautiful portraits, smooth skin tones, gentle focus fall-off and pleasing bokeh. The Utsunomiya teams who created them should be congratulated. Users of Sumire Primes will be very satisfied.

Both frames: 50mm Sumire Prime at T1.3

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Canon Sumire Prime Special Report

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