Jon Fauer, ASC www.fdtimes.com Sep 2015

FILM AND DIGITAL TIMES

Art, Technique, and Technology in Motion Picture Production Worldwide

ZEISS Factory Tour 2015

The Business of the Business: Dr. Winfried Scherle, ZEISS Executive VP

Dr. Winfried Scherle is Executive Vice President, ZEISS Consumer Optics Business Group. This interview was conducted at his office in Oberkochen, during lunch in the company's new restaurant, and later that evening over splendid seafood at Italia Giovanni in Aalen.

JON FAUER: How do you see the cine lens business now and where do you see it going?

WINFRIED SCHERLE: We saw our vision confirmed at NAB when RED introduced their Full Frame 8K camera. We always had the feeling that the Full Frame Format would come sooner or later. This was a confirmation of our idea to invest in the development of our Compact Primes and Compact Zooms, which cover Full Frame and also serve all smaller formats, such as Super 35.

What did you know that others didn't when you decided to go Full Frame?

I often make decisions from a gut feeling. This has been the more successful path in business, rather than engaging in heavy market analysis that often looks backwards. I think it's necessary to have a feeling of where things will go. Then you can create something new. If you analyze, including the support of research institutes, you're always looking for somebody to make a decision for you and whom you can blame in the case of no success—meaning not taking responsibility. I appreciate being in the position to make the decisions by myself, based also on the long-term existing close contact to customers and their critical feedback.

Why did you have that gut feeling? Was it because of your appreciation for still photography?

I believe that being involved in different business segments such as still and motion pictures provides a broader and more holistic view. From this you develop the feeling and experience if it is the right direction. For example, if you walk outside and feel that there's a thunderstorm coming, then you might be a little bit more careful. If the sun is shining, you might make the decision to climb high up in the mountains. It's very hard to describe. I think that's the unique thing about gut feelings. (Editor's note: Dr. Scherle has climbed the Himalayas and is a worldwide adventure traveler.)

You were proven correct with the RED announcement of a Full Frame / VistaVision camera. Will the other companies move to the 24x36 format for their cine cameras?

I can't say too much about how the other companies come to their decisions, but I'm convinced that in the near future the relevant innovations and improvements will be made with Full Frame sensors. With the huge number of FF still picture cameras being sold, these sensors will be available for attractive prices. Canon started with the 5D MKII and was, according to my understanding, surprised that the community used the still camera for motion pictures. Sony has the a7RII and a7S which is dedicated for motion pictures. I'm convinced we'll see more and more cine cameras with Full Format sensors.

But after you made the decision on something, you need time and patience until it's realized. If you decide on a path and then you get nervous, you might wind up changing direction too often. I'm convinced that it's important for us to have a stable product line with transparency about what we are doing, so customers get the feeling that if they invest in our product, their investment will be protected. At the end, it is about being a reliable partner and gaining the trust of customers.

The beauty of a Full Frame lens is that it covers pretty much everything: Super 35, Open Gate, Epic and Full Frame Sensors. And the good news is that Super 35 lenses will not become obsolete because you can crop or window that format on Full Frame cameras.

Yes. Of course, if you use the 24x36 mm full size of the Full Frame sensor, then you need to invest in the glass to cover it—but you also have the flexibility of serving all smaller formats. So, by investing in Full Format lenses you are future proof. This is especially important for rental houses who need to serve a wide variety of customers and equipment, but still get a good return on their investment.

Tell me about your new ZEISS cine lens manufacturing facility.

I think you saw our previous manufacturing and service facility five years ago, which was located on the 7th floor. Where I am actually sitting now in my new office was our service department. We wanted to improve quality, processes and assembly—which was always my dream. We made a lot of improvements in our lean manufacturing process. We did this first with our Compact Primes and Compact Zooms. Then we expanded the process to include the Ultra Primes, the Master Primes and now the Master Anamorphics. The idea was to create a facility with lean production to respond to the market fluctuations and its demands.

Can you explain what lean production means?

Lean production means that your manufacturing is very flexible with, at the end, a one piece-flow, which means single piece manufacturing. It is the opposite of batch manufacturing which we had many years ago. In one-piece flow, if the customer wants one specific lens, you can make that one particular lens within a month. In batch production, you have to make large quantities at the same time. That involves sourcing a lot more components and raw materials at the same time, and makes production slower. I think the secret to why we're successful today is that we have flexibility. For me, the goal is to serve the market in the most flexible way. We still have a long way to go in getting perfect and we never should stop looking for improvements to push the boundaries of perfection.

Your new facility is quite different from what I saw five years ago. Then, it was dark. Now, you have windows all around; it's light and bright. Your entire assembly area is now one big clean

room. You enter through an air lock, and wear clean room protective clothing. What caused all these changes in the way you approached manufacturing? Was it customer demand?

The windows allow for an open atmosphere and in the end a certain transparency which is necessary for continuous improvement. When working with optics, you always want to have very clean surroundings. If you don't, some dust will get in the lens and then you have to disassemble it. So it is mandatory for high-end optics to have a very clean assembly area.

There seemed to be a different atmosphere in the assembly area since last time. People seemed more cheerful, less stressed. I think the architecture has had an effect—and the lighting, the access to daylight and the cleanliness.

There's a new kind of openness. There are the large windows where you can look into the assembly area and the offices. I think if you work in an assembly line and there is stress, it's more probable that you make mistakes. If you can focus on the work, then this helps to provide excellent quality. Most people spend the largest active part of the day at their workplace in the company. So, I think it's our responsibility that the people who work here have an environment where they like to come and work and identify themselves with what they do. And if you like to come to work, you are motivated, which shows at the end in the results.

I also noticed that many of the tools in the assembly area were custom made by the workers themselves.

We involve our people because they often have the better ideas for improvement. Therefore, they are committed to drive the process by themselves. They are invited to bring in their ideas and suggest new methods of doing things, which again supports identification. In the past, you had an engineer who defined the process which often was then not accepted. Now it's completely a team effort and it is successful.

It was interesting to see your team in the assembly area making not only the tools but also customizing their work benches.

That's important because it influences the way you work. It offers a lot more imagination. And if there's a problem you start to think about fixing it. We don't have a panic button or ticking clock or pull-cord to stop the assembly line.

This is an example of our new spirit—you can see it throughout our company. We have new buildings, new facilities and it's part of a new identity. One of the key elements is openness. In addition to our aspirations of leading, inspiring, being precise and responsible, we now embrace this open culture. It's an atmosphere where everything is open, transparent, strongly related to the way we think. For example, the wall in my office is a glass window that supports transparency.

The interior design of the offices is an open plan. There are places to gather, to communicate. It's part of this philosophy. If you want to promote the brand, if you want to create some identity, it should be everywhere. It's the people. It's in the rooms. It's in the furniture. It's in the processes.

ZEISS has a long history of commitment to the well-being of employees. The company restaurant appears to be part of this philosophy and architectural style. It is beautiful and cheerful.

That's the reason we built a restaurant for the staff. The food is quite good; some people say it's the best restaurant in Oberkochen! We were very proud that Bryan Adams came here and gave an unplugged concert for our employees at the opening ceremonies of our restaurant which we call "ZEISS Kulturkantine".

Your ARRI/ZEISS Master Anamorphics are really taking off in popularity. Martin Scorsese and Rodrigo Prieto just finished a movie with them. The next "Star Wars" is using them. What is the reason for the sudden boom in popularity? I saw lots and lots of them in the assembly area today.

We are still ramping up production and we are also planning to expand the line. I think the reason for their popularity is the up-to-now unbeaten quality that is a new benchmark. They have the same quality our customers expect from our spherical primes, such as the Master Primes. This kind of quality has never before been available in anamorphic lenses, so it opens new ways of working.

What direction are you taking ZEISS? What's happening next?

For me, the next thing is to integrate all the ZEISS consumer divisions into a single unit. This also includes the implementation of a common product design language. If you look at the sport optics products or our photographic products, the design language has to tell you it's a ZEISS product. And, of course, by using synergies we're developing portfolios in all directions. The next big challenge is to find our role in the developing new digital world. Currently, we are on the hardware side but we have to think what our contribution can be beyond this. These are the challenges that we think will be the next big steps for the development of our business and the whole industry.

How is the photographic market different from cinema?

Still photography is an area where we have found our position and that we are developing further. You have seen the recently introduced ZEISS Batis (E-Mount AF Full Frame) lens family. We are expanding the ZEISS Otus (F and EF Mount Full Frame) and ZEISS Loxia (E-Mount Full Frame) lens families and will introduce a new lens family this autumn. As still and motion pictures are coming closer together, we see a lot of opportunities in this area.

Also, we are looking for new, untapped fields in the consumer business that might be interesting for ZEISS to enter: products that have the promise of high quality and long-term value.

Can you explain the relationship you have with Sony?

ZEISS has been open to partners for quite some time. We have been partnering with ARRI for more than 75 years and more recently with Nokia (now Microsoft), and Logitech. This year will actually mark 20 years of partnership with Sony, which has been operating in the fast-moving consumer industry for a long time. During this period we have been working closely together on the consumer side and on an informal level with the professional side. Sony brought their expertise in consumer electronics and we contributed optical competence which is the core of a win-win collaboration. We are involved in design and quality assurance, and Sony's part is production and sales of the co-branded products.

Who decides what lenses are going to be made under the Sony brand and under the ZEISS brand?

We have regular strategy meetings with Sony where we discuss roadmaps and so on but please understand that we can't disclose further details.

Do you think Sony is committed to expanding the E-mount line?

Yes, they have been very successful by creating a new market with mirrorless cameras for high-end applications. I think they were surprised about the success when they introduced the first mirrorless cameras in an environment that was dominated by DSLRs. So the E-mount market and mirrorless cameras have been a really disruptive technology.

Very popular especially in Japan?

It started to be very popular in Japan but now it's spreading around the world. And it's getting even more relevant with the a7 series Full Format cameras. We are convinced that this will also drive the motion picture industry.

I think this familiar format size will take off for cine. I was surprised we didn't see more Full Frame cine cameras at NAB.

Last year Sony showed the a7S. And the logical next step would have been a cine camera, so we will see what Sony will show in the future. Yet it was RED Digital Cinema [who introduced a full frame 8K camera first that windows to 4K Super 35].

RED again comes out first with the next disruptive paradigm.

The community experiences Jim Jannard and RED as revolutionaries—initiating big changes. It's what I would have expected.

The RED 8K sensor is 41 mm wide x 21 mm high, slightly larger than Full Format. You can still shoot 4K in the familiar Super 35 area. So, to cover both the PL size and the big full frame area, will we stay with a PL mount? Or will the manufacturers get together and agree on a new standard with a shorter flange depth, since we don't have spinning mirror shutters anymore?

I would be very happy to have a new standard because I think it benefits the customer. We had discussions with other lens manufacturers who also expressed interest in this. If you have a standardized mount, customers would have the flexibility to buy any combination of camera and lens, and use their preferred setup. I think we should offer the customers a standardized mount both on the camera and on the lens. Everyone would benefit from a new standardized mount and I would be really glad if the industry would decide on such a mount, because of the customer's benefit. At the end it also would drive innovation due to the competition between the manufactures and the lower investment barrier for the customers.

Do you think that is possible?

I currently think many companies believe they can win by promoting a closed system based on their own mount. But we would give strong support that this idea is changing. Some companies lead for a while, and then other companies lead. So it's more the ego of the company to protect their mount, perhaps. But for the customer, it would definitely be beneficial to establish a standardized mount. Although, what might happen is a system of exchange. Like changing tires on a car, for example. [laughs.] But overall, throughout history, if you have standardization, that is good for long-term success.

But each company wants to protect their own legacy of mounts and flange depth.

This works if you're leading the market. If you have by far the biggest market share, then there's some value to protecting it. But, in the relatively small cine industry, we have a lot of competition now. Investment and innovation will be driven by flexibility. This is especially true for the camera rental houses that have to recoup their investments and therefore need stability. In the end, they might be reluctant to invest in a particular system if it is not reliable and future-proof.

Will existing PL-mount Super35 lenses become obsolete?

We all should consider how best to serve the customer and this was also a reason to introduce Full Frame lenses. Above all, I would like to provide good products for the customer, so that's the foundation of our business. But on the other hand, if you do good things for the customer, they will come back and stay loyal to you, which again allows for the driving of innovation.

In the cine market, will interest in anamorphic continue?

Currently we see an ongoing interest which makes it attractive for us, but in the end it's like looking into a crystal ball.

But you've been good at that so far. Your gut feeling.

I'm convinced that this will stay for a while. Maybe not forever. The world is changing. But for the next few years, anamorphics will play a major role. And that's the reason why we're still investing more in anamorphics.

Looking towards the future of the cine world, are we going to see more electronics in lenses and cameras the way still

cameras can correct for shading and aberrations and so on?

I think this is a good idea and can benefit the customer. Having good data available for post-processing would be a very good approach. Again, my wish would be to have a standardized interface and standardized metadata available for image processing. Definitely, I think it would be the right approach to have more data available in the lens that gives the system the knowledge of the actual status of the lens—distortion, color, shading and so on.

Also looking towards the future, some of the manufacturers are worried that maybe we're going to see a lowering of prices. As the medium becomes more democratized, customers may demand lenses that are not as expensive.

There is a market for lower-end, lower budget lenses. Some of the other companies are doing this. On the other hand, if you want to have a product that can be useful for several generations of cameras, I think you will invest in the high end. It is our philosophy to stay in the high end. We will stay with prices where you get a lot for your invested money. And our expectation is that our lenses will survive for generations of cameras.

So you feel there will always be a high end in cinema?

Yes. Of course.

Some rental houses were worried that about competition driven by the Asian manufacturers to try to lower prices.

That philosophy always comes from consumer electronics. But in the end, nobody will be the winner from such games. If you look at the consumer television manufacturers, the big players fought among themselves and truly hurt their own markets.

Why is that?

They lowered the prices too aggressively. My own experience is a good example. I bought a 3D TV at Christmas and half a year later, it was half the price. I was angry about that. Similarly, if a rental house or DP invests in an expensive product that plunges in price shortly after, they will never get a return on their investment. We feel responsible that our customers are proud of products from ZEISS and have a long-term usage of their investment.

Grant Petty, CEO of Blackmagic, has said that we are experiencing not a convergence of the consumer electronics business and high-end cinema, but actually a divergence. There are new markets and more different opportunities and there will always be a high end, a middle and a low end. Do you agree?

It's changing a lot. There will be more pictures and images in the world. Even with mobile phones, many more still and video images are shot. For me, it's a question how to handle all this data.

How do you handle all this data?

We don't have an answer yet. In the "good old days," up to a few years ago, if I shot some pictures, I had a couple of film rolls and I thought about each picture I made. Now, I can shoot as many pictures as I like and then come home and say, "Oh, when I retire I may start to sort my pictures." Yes, some day. We have an inflation of pictures, and we need to find better ways to handle the huge amount of pictures we create. But I'm convinced that good procedures will be available.

What is your main commitment at ZEISS today?

Our motivation is to make the best products for our customers and to enable them to do superior imaging. By doing this, customers will buy our products, bringing the economic success required by any company to invest in the next generation of progress. If you think about the Master Anamorphics, we attempted to do something new and set a new benchmark that would benefit our customers, and now they are desired.

There seems to be a company connection between products, precision and philosophy.

Our self-understanding is to be a leading company by creating new benchmarks in the industry. And here, as mentioned before, we like to enable our customers to realize their ambitions. People working with our products should be inspired.

If you take a Master Anamorphic, I think it can inspire the creativity of cinematographers. They like to have a precise tool. The focus and iris scales have to be precise. And then, we have to be open to changes in the industry, spotting new trends and by serving the changing needs of our customers. This is also reflected in the architecture and surroundings in which our products are created and built. The concept is open. An open architecture supports open communication, resulting in good ideas. And in the end we are responsible partners for our customers in case they need support.

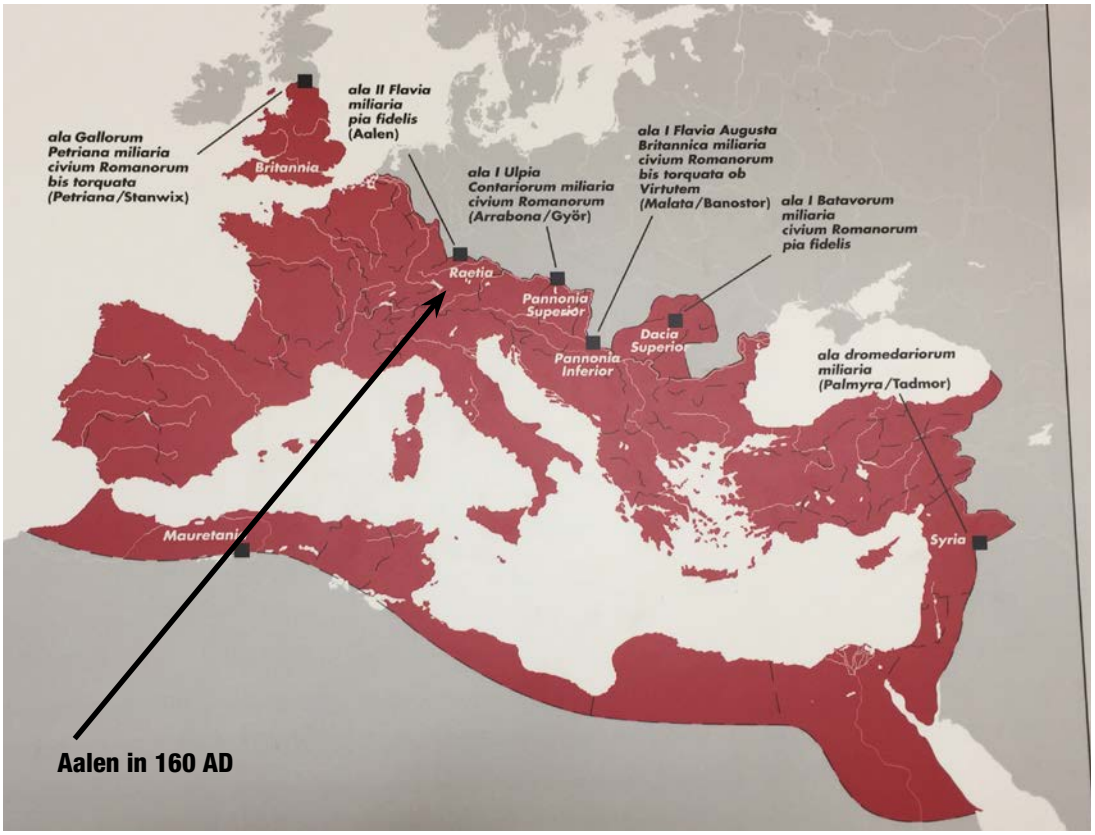
In a way, the lens is a work of art and the cinematographer is making art as well. Now, every cinematographer wants to be unique and have his or her own unique look. How can you help them to achieve this?

We always aim to make the best, almost perfect lenses. If you like certain effects you can, of course, modify those lenses by degrading performance. For example, we provide flare sets for the Master Anamorphics. Furthermore, you can use filters and nets.

I believe it's advantageous for the artist to have a really good lens and then make modifications to reduce some of the perfections by modifications. It never can work the other way around. You can't take an inferior lens and add a filter to make it perfect. Sometimes, people talk about the "look" if they don't have a perfect lens. We just try to make the best and then leave it to the cinematographer to manipulate the lens to create their unique and special style.


ZEISS
ZEISS
ZEISS
ZEISS

Carl Zeiss AG World Headquarters is in Oberkochen, Germany—8 km south of Aalen (above), and roughly halfway between Frankfurt to the northwest and Munich to the southeast.

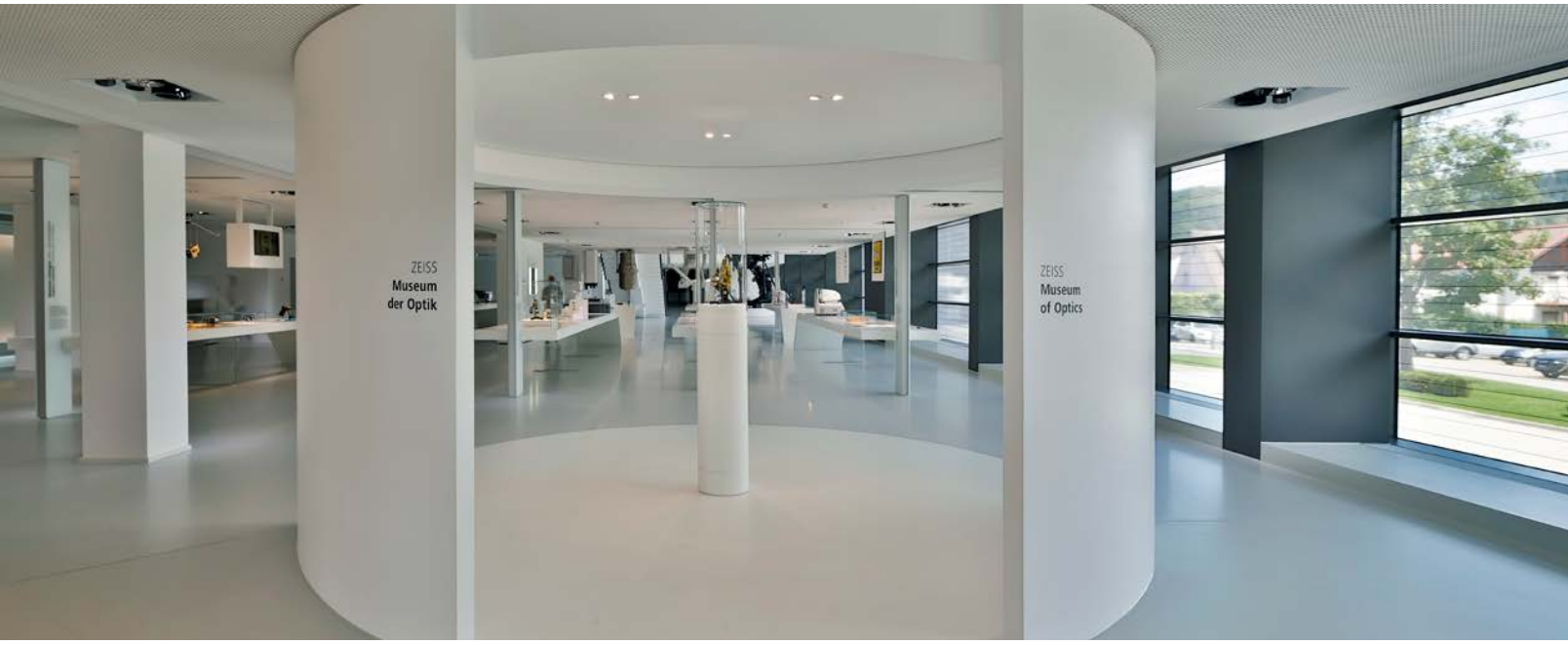


Aalen (Ala II Flavia) was the largest Roman cavalry garrison north of the Alps in 160 AD. It was part of the Limes Germanicus that stretched 568 km (353 mi) along the northern frontier of the Roman Empire. The wall was 6 meters high, protected by 60 forts and 900 watchtowers.

Headquarters and exterior of new Museum.

Exterior of ZEISS Restaurant.

ZEISS Museum of Optics in Oberkochen



ZEISS Museum of Optics.

Photos by Tobias Brandstetter with Sony a7S and ZEISS Batis lenses; and Jon Fauer with Sony RX100 Mark IV (ZEISS/Sony lens).

Thanks to Michael Schiehlen, ZEISS Director of Sales, Tobias Brandstetter, Public Relations ZEISS Camera Lenses, and everyone else at ZEISS for all their help with this article and for making my visit not only possible but also very enjoyable.

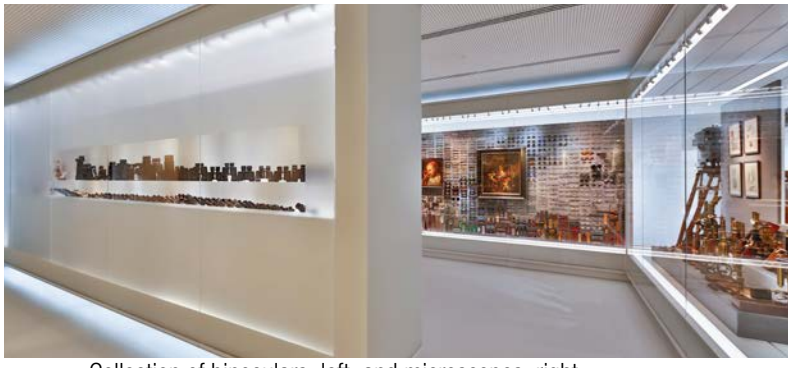
A lot has changed in the 5 years since we last visited (see FDTimes ZEISS BOOK, Dec 2010: tiny.cc/zeiss2010). You still park in the same visitor lot across the street from the shimmering glass tower and still have to be sure to ask the nice receptionist for a token that lets you exit later in the day.

Now there's a fabulous new museum to the right of the lobby. It's open to the public. There's also a public cafe with good espresso and fresh pastries. Try the cherry tart when it's in season.

The museum is an architectural gem, as clean and bright as the latest lens being built two floors above, and as white as the beard of our guide, Dr. Dietmar Mondon. He's an engaging, articulate and jovial docent of the museum, having worked at ZEISS for more than 40 years, with a guru's command of facts and history.

Dietmar Mondon (L) and Tobias Brandstetter (R)

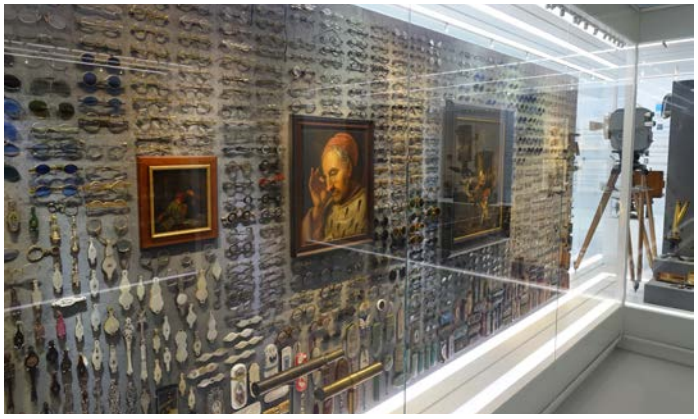
Collection of antique telescopes and eyeglasses.



Collection of binoculars, left, and microscopes, right.

Current ZEISS products: binoculars, spotting scopes, cine lenses.

Reading stone, as used in the middle ages.


ZEISS's collection of spectacles and artwork.


Reading glasses, circa 1250.


Pince nez.

The following text is edited from notes and audio as Dr. Dietmar Mondon took me on a magical demystifying tour of the 1000 square meters (10,700 square feet) of exhibition space in the ZEISS Museum of Optics in Oberkochen.

By Dr. Dietmar Mondon

Once upon a time, a long time ago, someone found a naturally polished crystal in a river bed. Its top was curved. He put it on a piece of parchment, and exclaimed, "Hey, this magnifies. I can read again."

In the middle ages, science was mostly in the monasteries. The monks knew how to read and write. But, since vision changes as we get older, they encountered increasing difficulty being able to read what they had written. They used reading stones made from glass spheres cut in half.

In the Early Days, Optics Was All About Reading

The ZEISS Optical Museum has 8 square meters of display cases containing just a fraction of ZEISS's vast collection of spectacles and artwork.

Glasses have become part of our culture. They have at least three functions. One, improving our distance vision. Two, helping us to read and to see up close. And three, fashion. You can spend a fortune for the frame. From the very beginning, designers of glasses had to figure out how to keep the two pieces of glass on a person's face. They came up with designs that squeezed the nose, attached it to a hat, strings behind the ears. The history of glasses is a product of daily life.

Glass is a very old material. The Egyptians knew the recipe. They made glass beads and pots. The Romans made flat windows. But using glass for optical purposes first began around 1250 (Left, 2nd from top). The very first samples we found were only the glass elements. The frames were mostly made of wood, and they had deteriorated. The ZEISS collection includes glasses worn by a famous German poet-writer and Emperor Franz Joseph I of Austria.

Magnification to Discover the World

In the beginning, lenses were made for reading. Later on, they were used for magnification. The center of the universe for polishing and making lenses was the Netherlands. Glass came from Italy, where they had enough wood for fires to melt the glass. But the finishing was done in the Netherlands, and the first telescopes and microscopes were made there at the turn of the 17th century.

An oversimplification of optics is that you can have convex and concave elements. Combine them in various focal lengths and permutations, and you can magnify. In October 1608, a patent application was reviewed in the Netherlands "for a device that aided seeing faraway things as though nearby." It consisted of a convex and concave lens in a tube. The combination magnified objects three or four times. Hence, the telescope. Hans Lipperhey made several binocular versions: opera glasses for special occasions, and not just for going to the theater but to see who else in the audience was there—and with whom.

Revolutionary Research in Italy

An Italian gentleman, Galileo Galilei, had heard about the new Dutch telescopes. He bought one and disassembled it.

Early telescopes.

Napoleon's spyglasses.

Carl Zeiss Microscope from 1884, above.
Cameras, enlargers, microscopes, below.

He taught himself how to make lenses, improved the system and produced a telescope that magnified 9x, and later 30x. Galileo Galilei used this telescope and looked into the night sky. And he came to the conclusion that Ptolemy's theory (around 100 AD) of the Earth being the center of the universe was wrong. Copernicus was right. The earth revolved around the sun. So, the invention of the telescope had provided scientific proof that changed the knowledge of the world.

Considering how much this knowledge would change his life, one might say that Galileo made a big mistake. He published his findings. Pope Urban VIII was not amused, famously telling the Tuscan Ambassador to Rome, "Your Galileo has ventured to meddle with things that he ought not to and with the most important and dangerous subjects that can be stirred up these days."

In 1611, Johannes Kepler described a telescope with a convex objective lens, a convex eyepiece lens, and a greater distance between them. The image was upside down. But that didn't matter if you were looking at stars. Of course, upside down images did matter if you were a ship's captain or a general. The museum has some of Napoleon's spyglasses that he "lost" after the battle of Waterloo.

New Fields of Application

With the telescope, astronomy turned into an optical science. But at the same time, new businesses started. Navigation, construction and surveying. When you add scales and a level to your telescope, you can measure elevation. The Romans had used a table holding a small tub filled with water to have a line of sight. They managed to bring water many kilometers away from Rome. All they needed was an incline.

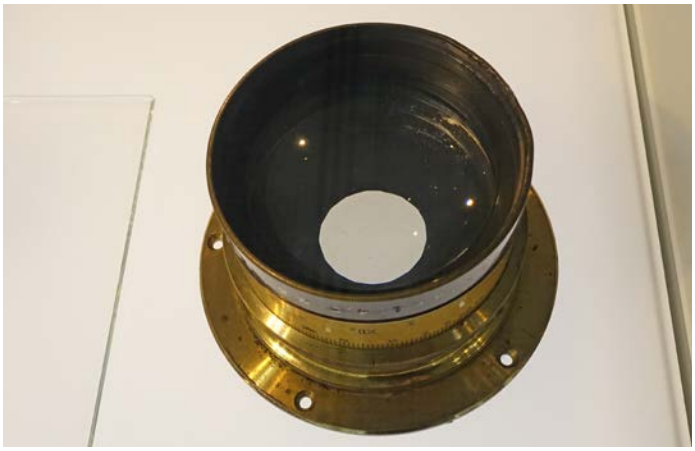
Now, did you ever look through a telescope the wrong way? What happens? You have a microscope.

Forty years after Napoleon won the battle of Jena in 1806, a gentleman named Carl Zeiss set up a workshop there that would turn Jena into a "city of optics." Carl Zeiss (1816-1888) was born in Weimar, the fifth of twelve children. From 1835 to 1838, he attended lectures at the University of Jena.

Jena – Cradle of Scientific Optics

In 1846, Carl Zeiss set up a small workshop in Jena to repair, and later build, scientific instruments and microscopes for the University. Like his successful contemporaries of the industrial revolution, he recognized the importance of science, precision and mass production in the manufacturing process, but he encountered the same problem all those guys had at the time. They put things together until they worked, and then checked the quality. It was trial and error.

Trial and error is not a good business model. If you produce 10 sets using the same steps but the outcome is totally different each time, then you might end up with 5 sets destined for the garbage bin. Zeiss realized that this problem could be solved by science and that there had to be measurable reasons for the discrepancies. A man named Ernst Abbe was teaching mathematics and physics in Jena. Zeiss invited Abbe to join the company in 1866. In the beginning, Abbe immersed himself in the physics of optical imaging, especially microscopy. He discovered a lot of secrets and necessary procedures. In 1872, the first improved ZEISS microscopes were produced using Abbe's new calculations.



Colors Make it Difficult

Since childhood, you have been familiar with one of the big problems in optics. You know it as a rainbow. We learned that, officially, white light, which doesn't really exist, consists of a lot of different colors or frequencies. When you want to put an optical system together with one lens, you cannot have a perfectly corrected image. You get chromatic aberration. So you have to do some tricks.

Look at one of Mr. Abbe's key findings, the Abbe equation, and notice that green light is deflected more than red. This is caused by the shorter wave length. So if you want to have an optical system that focuses red, blue and green light onto the same plane, you have to use different lenses made from different types of glass.

And this is where gentlemen number three enters the party: Otto Schott. Schott started his glass manufacturing company in Jena. He delivered glass with the necessary refractive index and dispersion so that an apochromatic lens, where the different colors converge at the same plane, could be built. In 1868 he invented the apochromatic lens, a microscope lens that eliminates both the primary and secondary color distortion, and by 1886 they were selling apochromatic microscope objectives.

So, this was the beginning of scientific optical manufacturing. And what do you think is the most important invention in the field of optics?

Thin Layers

Whenever light passes through different media, from air to glass and then from glass to air again, you lose energy in the form of unwanted reflection that impairs imaging—about 5% per surface.

The answer to the question is coating. In 1935, coating was invented at ZEISS by Professor Alexander Smakula. On your material, glass, you put a very thin coating. You make it a quarter of the wave length you are going to use. What happens? You have a reflection on the front side. You have a reflection on the rear side. They have a shift of a quarter wave length each, with a total of half a wave length. They meet again with half a wave length phase shift destructive interference, and your reflection is gone. It's very simple. You just have to have the idea.

If you have a camera lens with five elements, fifty percent of the energy is gone by reflection if it's not coated. Today, there is hardly a single piece of optics uncoated.

And now we come to a very interesting fact. When you know how to kill reflections, you get a gift. You learn how to increase reflections. We are making fantastic mirrors in our company too. So reflection is wanted or unwanted depending upon the application.

A Unique Form of Ownership

Initially, Carl Zeiss was the sole proprietor of the company. In 1875, Ernst Abbe became a business partner. In 1881, Roderick Zeiss, Carl's oldest son, joined as third partner. When Carl Zeiss died in 1889, Roderick retired. Two years later, Abbe converted the privately-owned company into a foundation, the Carl Zeiss Stiftung. He wanted to company to be independent from the temper of a personal owner. At the same time, he insisted that the Foundation would support social issues for its employees as well as for the community. The Foundation retained Abbe's bylaws, unchanged, until 2004. Today, Carl Zeiss AG is a stock corporation, but you can't buy its shares. It is not publicly traded. The Foundation still holds full ownership of Carl Zeiss and the sister Corporation Schott AG, including all the other parts of these industrial groups.

Planetariums and Photography

The museum is home to the smallest ZEISS planetarium in the world. Its digital projectors have a contrast ratio of 2.5 million to 1. They can produce pitch black, which is necessary to show a beautiful night sky. The planetarium is another ZEISS invention. It was invented for the German Museum in Munich in 1923, the first planetarium to have a movable sky. The company still makes analog projectors, although most planetariums today are hybrids. In the analog projectors, there is one glass fiber for each one of up to 9,100 stars.

The ZEISS Planar lens for photography was designed by Paul Rudolph in 1896. It was a six-element symmetrical design and quite sharp, but, because of all the air-to-glass surfaces, had a lot of flare. In 1902, ZEISS introduced Paul Rudolph's Tessar, a four-element design. It was less sharp, but had better contrast than the Planar. The Tessar went on to become the most copied lens in the world.

To the Moon and Hollywood

The Hasselblad with ZEISS lenses went to the moon on Apollo 11 in 1969. There are 24 more camera and lens sets waiting for you on the moon. That is because the astronauts only brought back the film cassettes. They left the cameras and lenses on the moon. Astronaut Buzz Aldrin came here and cut the ribbon to this museum in November 2014. When he saw a replica of his camera, he said, "Oh, that's heavy." Of course on the moon, it's 1/8th the weight.

Today, ZEISS has about 25,000 employees worldwide. They deliver around two patents per day per work week, 400 per year. When NASA did reconnaissance of the far side of moon on Apollo 8, they ordered a very fast lens from ZEISS. That's the lens used by Stanley Kubrick on "Barry Lyndon."

In partnership with ARRI, ZEISS has been providing lenses for many major motion pictures, recognized by camera crews worldwide and acknowledged by three Scientific-Technical Academy Awards.

ZEISS Museum of Optics (cont'd)

ZEISS Semiconductor Manufacturing Technology (SMT) lens images 20 nanometer structures onto microchips.

Replica of the Hasselblad and ZEISS lens that went to the moon on Apollo 11.

ZEISS Planetarium Projector.

ZEISS Master Prime lens on an ARRI Alexa.

Admiral Togo's dual-power ZEISS "revolver" binoculars, 1904-05.

ZEISS Museum Shop.

Forum and café next to the ZEISS Optical Museum.

ZEISS Camera Lens Team.

Tour of ZEISS Camera Lens Assembly

Josef Kohnle, above, is Senior Director of Operations for Camera Lens Manufacturing at ZEISS. Following a morning tour of the ZEISS Optical Museum, it was time to suit up and enter the clean room environment of the Camera Lens Assembly area. The following is a narrative from notes and audio as Josef guided me through the facility. The photos are by Tobias Brandstetter, taken on a Sony a7S with ZEISS Batis 2/25 and 1.8/85 Full Frame e-mount lenses.

By Josef Kohnle. Photos by Tobias Brandstetter.

In planning the new assembly facility, the focus was to improve our system. If you want improvement, you need a benchmark, and it helps to look at what other companies are doing. And not only in the cinema and photographic industry. We had a lot of contacts with car manufacturers. We went on a lean production tour in Japan, visiting companies that use lean processes. Then we compared that with our system.

Lean manufacturing is a process originally identified with Toyota, which emphasized reduction of waste to improve customer value. We do some special things to try to separate our products from others. ZEISS is famous for the quality of its products and the association with ARRI and Sony and others. Our cine products—Master Primes, Ultra Primes, Master Anamorphics—are made in partnership with ARRI. But what happens when orders go up or down? How do we respond quickly to increased demand? Fortunately, we have many departments here in Oberkochen. So, if demand for certain focal lengths of cine lenses goes down, we can "lend" some of our team to, for example, the medical assembly group or somewhere else as needed. Likewise, if demand goes up, we can "borrow" people from our semiconductor production group if they are slowing down. We have a highly qualified workforce, and since the job is consistent in optics, it's quick and easy to have this flexibility.

What you see now is quite different from what you saw when you were here a few years ago. First, the workspace has been totally renovated. Everything is cleaner. Clean air enters from the ceiling and air exits at floor level. We are more focused on the customer. We have reorganized into a group for ARRI cine lenses, and then we have another unit for the Compact Primes and Zooms.

We adhere to the philosophy of one piece flow. We are not building big batches. So, if a customer orders a 15 mm Compact Prime today, we can deliver a 15 mm Compact Prime very soon.

One piece flow means we work on one lens at a time. That's the opposite of batch production, where you make larger numbers of the same thing, the same lens, at one time.

Our logistics and inventory department is on the ground floor. The assembly area is on the second floor, and there is an elevator between them. A few years ago, we were scattered all over the building. All the parts are in one place. We pick the parts downstairs, they come up here, and we assemble the lens. The process requires very good quality every step of the way. Our R&D had to develop parts that the suppliers are able to produce. The suppliers have to be very good, and our assembly process has to be able to recognize if there are any problems with the delivered parts and be able to manage those problems.

One of the biggest problems in lens assembly is dust in the lens. A lens can magnify up to 50 times. So if there are particles of dust that you are not able to see on an element with the naked eye, that piece of dust can look 50 times larger when the lens is finished and assembled.

You ask why we didn't worry about that in the old days? What changed? Our customers have become more particular, for sure. And also, our main customer is ARRI. If ARRI wants to give their customers the security that they just bought the best product, we have to continue to improve our process, to improve our quality.

We use special vacuum cleaners to clean the lenses, because often, if we try to blow the dirt away, it flies into somewhere else. It's not gone. Some areas of the assembly facility are bright and others are darker. We need darkness where we check the lenses, because if you want to see dust, reflections or scratches on the surface of the lens, you need a dark background. But the whole room is not as dark as it used to be, so it's a nicer work environment.

Each work area is configured in a U shape. Each workstation has all the equipment needed for the tasks. The distance to grab something should be, at most, 25 centimeters. That's why it's positioned at an angle.

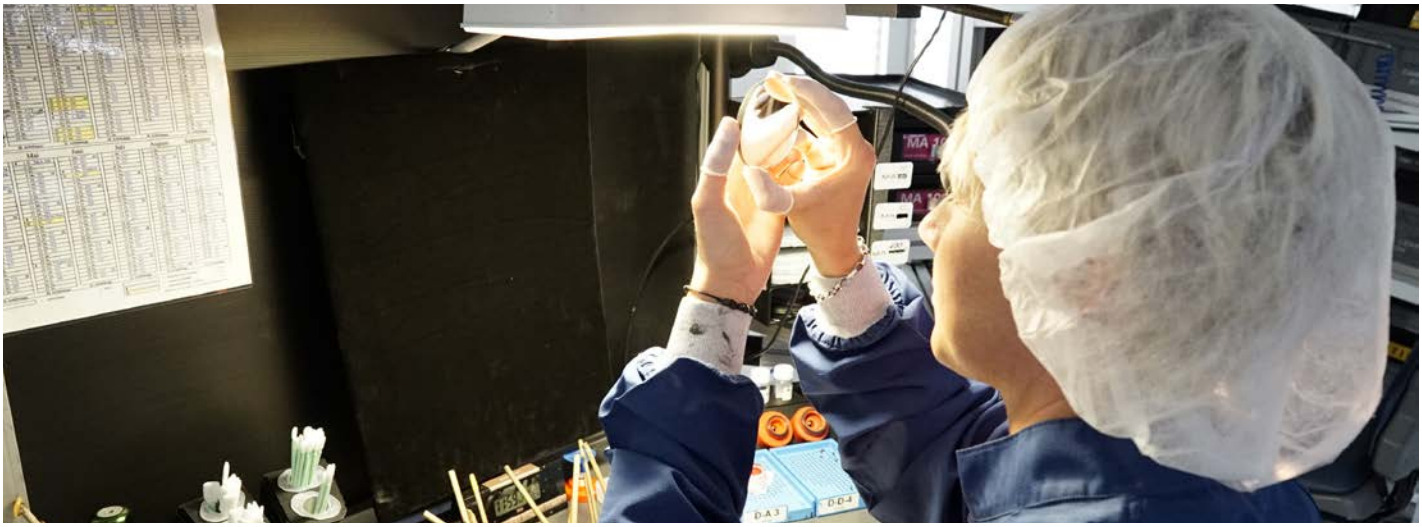
The Compact Primes are finished on the K8 machine. We measure all the data, and then the focus scale is engraved in our mechanical workshop upstairs. It's still the same technique as before for the Master and Ultra Primes.

The Mechanical Workshop is upstairs, on the 6th floor, and there are no big changes since you visited the last time. We call them on a radio and tell them which scale to make, and the scale comes down 20 minutes later. The process for the ARRI and the Cine products is still the same.

The machines in the mechanical workshop are also arranged in U shapes, like the assembly area. This is where raw material is machined to very precise tolerances. For example, the helical thread of an Ultra Prime focus barrel has to be absolutely precise. There can be no air gaps, because if you turn your lens it must move very smoothly. We try to buy the best mechanical parts from our suppliers, but sometimes they just cannot finish them with the precision that we need. So we do the final steps over here; sometimes they are done by hand.

When the focus scale comes down from upstairs, it's assembled and we check the lens again with an MTF reading to be sure it is correct. Then we do a final inspection. Control is better than

Tour of ZEISS Camera Lens Assembly (cont'd)



trust. For the last step, when everything is finished, we go to the K9 and check that everything is okay.

The Compact Zooms are assembled at workstations next to the Compact Prime area. When we first started building Compact Zoom lenses, our sales people sold more of them than we expected. So we quickly had to ramp up production.

At the moment, we have three Compact Zooms in the market: 15-30, 28-80, and 70-200. Since they cover the Full Frame Format (24x36 mm), we hope they will become even more popular with the arrival of the new RED 8K camera.

We have a training area for all our people. If there are problems or reports coming back from customers, we have a table where these issues can be analyzed.

We also have a repair area. We can discuss the problem, we can repair the lens and at the same time, qualify and train our people. If it's a man-made mistake, we try to figure out a way so it does not happen again. That way, we don't disturb the regular process of assembly.

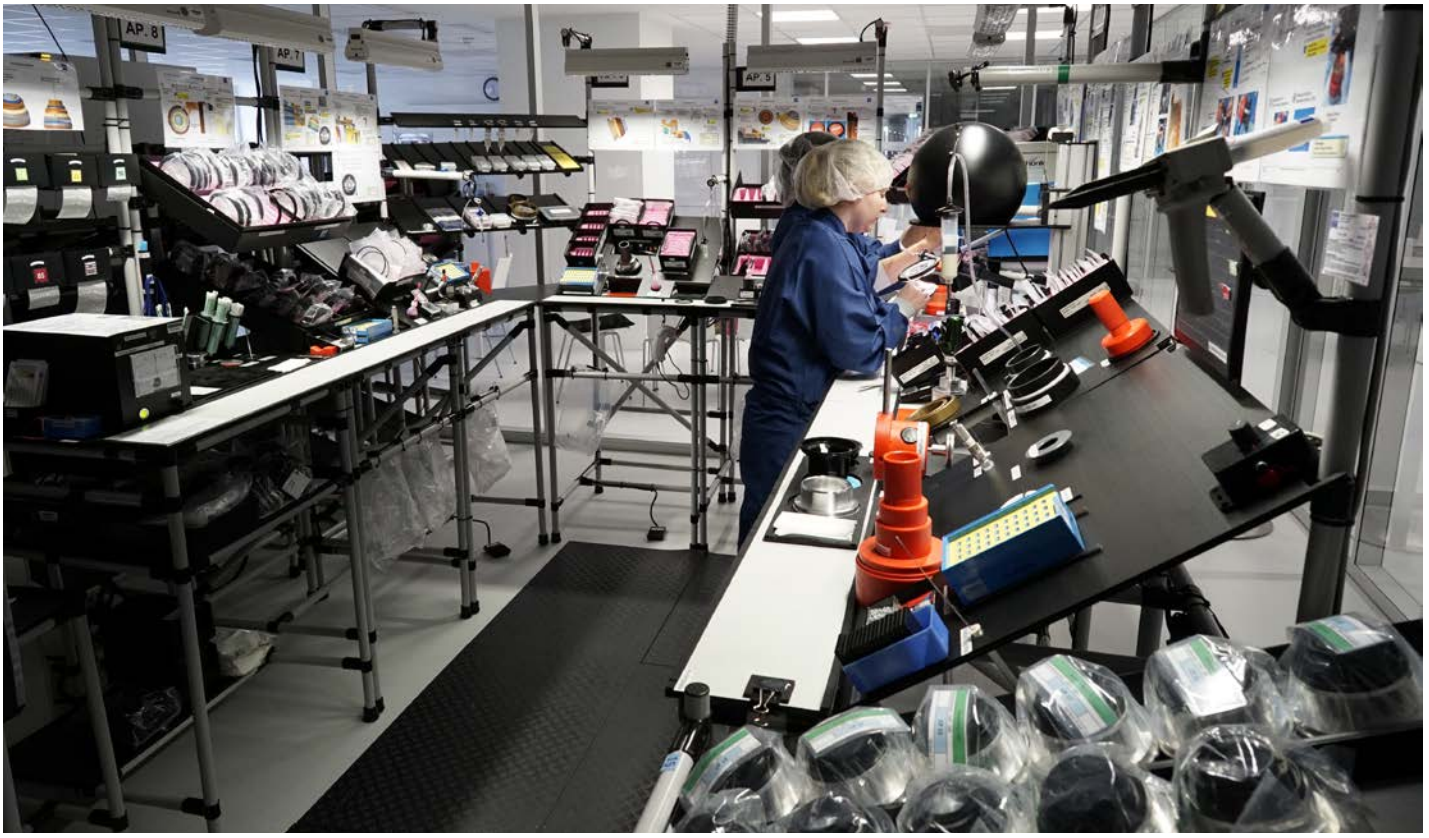
We call the training department the "Dojo." Dojo traditionally is a place where Japanese martial arts are practiced, but it can also mean a place for any of the Japanese arts. "Do" means "way;" Dojo means "place of the way."

The workbenches for the ARRI/ZEISS lines are a little different. They are sturdier, more stable—because the lenses are more complex and expensive and the process has to be more precise. The Compact Prime and Zoom area has pictures of the procedure at each workstation. There are no still pictures in the ARRI/ZEISS lines—there are videos. The team can watch videos of the assembly process or get updates. They can interact with the computer.

If they have a question they can communicate with the Industrial Engineering Department and tell them, "I have a problem." They can show directly on the computer where the problem is, and the engineering team can suggest how to fix it. Or they can show the engineers some of their suggestions on how to do something better.

They can also check the video monitor to see what's for lunch. It's Monday today, so there's a choice of Sauerbraten, fish or Bratwurst. Tomato salad, soup, and all kinds of desserts. Let's go have lunch.

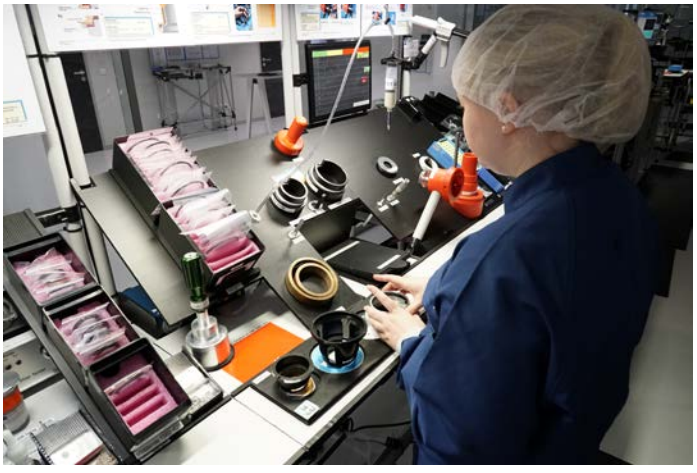
Assembling ZEISS Compact Prime Lenses



One piece flow: U-shaped work area. All parts and tools are within 25 cm reach. That's the reason the work surface is angled.

Barrel assembly of ZEISS Compact Prime lenses.

The supply system ensures that the "supermarket" is always stocked.



If any parts bins get low, a message is sent for a refill.

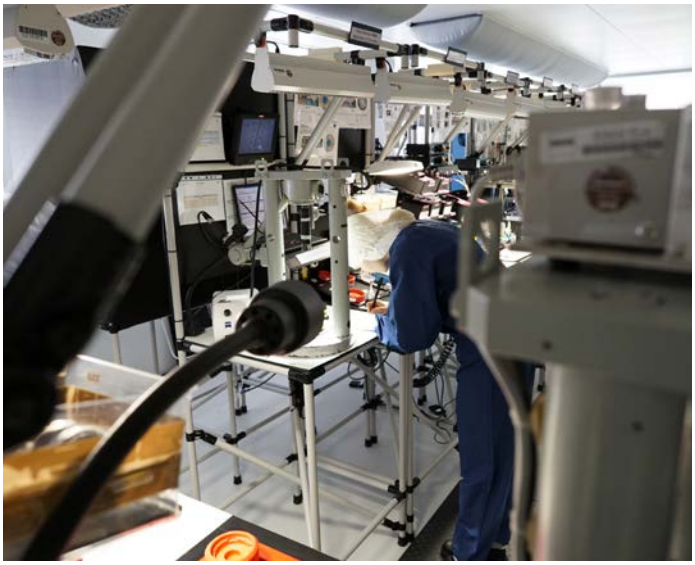
Checking the optical centering and finishing a Compact Prime.

Assembling ZEISS Compact Zoom Lenses

Checking Compact Zoom with focus scale at five feet.

The Compact Zooms use a cam focus system.

Optical elements are delivered pre-cleaned in protective cases



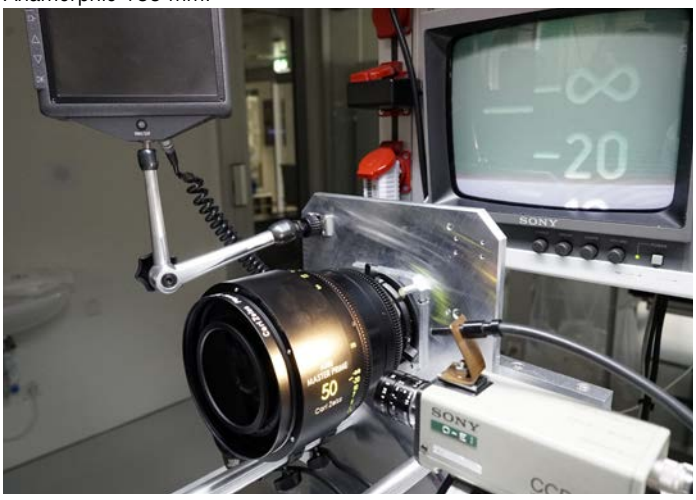
Assembling ARRI/ZEISS Master Anamorphics & Master Primes

Assembling ARRI/ZEISS Master Anamorphics & Master Primes (cont'd)

Opposite page: ARRI/ZEISS line. Cylinders for Master Anamorphics.
Above: Master Anamorphic 135 mm workstation. First step is building the barrels, then putting the optics into the barrels, next, using the K8 MTF Testers to adjust the lenses, add the focus barrel and then test again.

Special tools to position the optical elements inside a Master Anamorphic 135 mm.

Master Anamorphic 100 mm assembly.



Calibration of a 50 mm Master Prime is checked and its parameters are stored in a database to help in case of future service requests.

Measuring lenses in real time at three different frequencies on ZEISS K8 MTF Tester. T-Stop tester at left. This is the same test equipment used by authorized ZEISS service facilities worldwide.

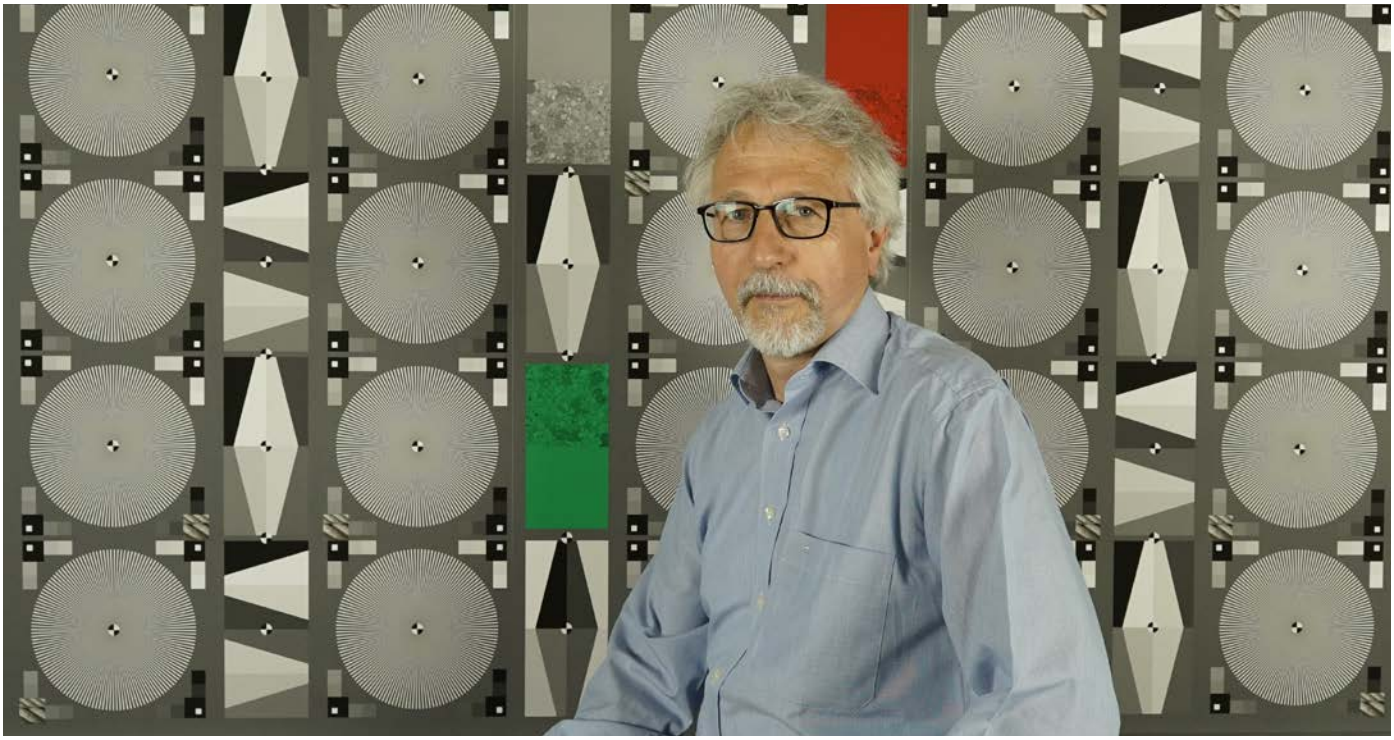
ZEISS Mechanical Workshop

The Mechanical Workshop engraves focus scales on demand—connected by radio to the assembly area a few floors below. At left: the intricate focus scale of an ARRI/ZEISS Master Macro 100, which focuses to 13 3/4" from the image plane (1:1 magnification ratio). From the time an order comes in until it's delivered takes about 20 minutes. Below: CNC machines, precision lens barrels, "supermarket" style parts delivery.

Logistics

The logistics department is on the ground floor. This is where parts come in and finished lenses go out. When the assembly department calls to have stock replenished, they are sent cleaned and sent upstairs in dust-proof bins. The parts enter the clean room through an air-lock and are checked again for dust. If dust is present, the parts are cleaned again. Finished lenses go out to the logistics department in the opposite direction.

Dr. Hubert Nasse's Lab, or Why You Should Take Your Lens Projector with a Grain of Salt



The last stop on my tour of ZEISS was the optical lab of Dr. Hubert Nasse. He was testing ZEISS Compact Zooms on the latest Sony a7 cameras. Dr. Nasse presented eye-opening suggestions for practical lens testing by rental houses and owners. He said:

"For a long time, the traditional test equipment for lenses was relatively simple, but nevertheless, quite sophisticated: the lens projector. A high precision projector gave you a quick overview about the quality of the lens, checking the scale accuracy and such things. But, of course, projection has one disadvantage because sometimes the eye may be fooled. Sometimes you'll have lenses with high resolution but low contrast. Therefore, the black and white pattern of a test chart in the projector can fool the eye into believing the lens has a high resolution. You believe because, wow, you can see 150 line pairs. But your eye forgets that it is seeing resolution on a rather low level of contrast, which is not so useful in a real-life situation working together with the camera. We are looking at improved ways to evaluate lenses, using a "softer" evaluation of the image file. We are using charts that deviate from the traditional style. The usual Siemens Star is a square wave. It just has black and white. The charts we are testing are a closer approximation to a sine wave function. That's why it looks rather odd at first glance. We don't see it as a sine wave, but it really is a symmetrical pattern because our eye sees intensity on a logarithmic scale. On a linear scale, it is a sine wave. That is a big advantage in calculating the mathematics. So, we take photos of this chart and analyze the Siemens stars with respect to the modulation yields of the contrast in the image plane.

"To see the results, we divide each star, like pieces of a cake, into eight pieces. That lets us take into account the variation of modulation with the direction of structure.

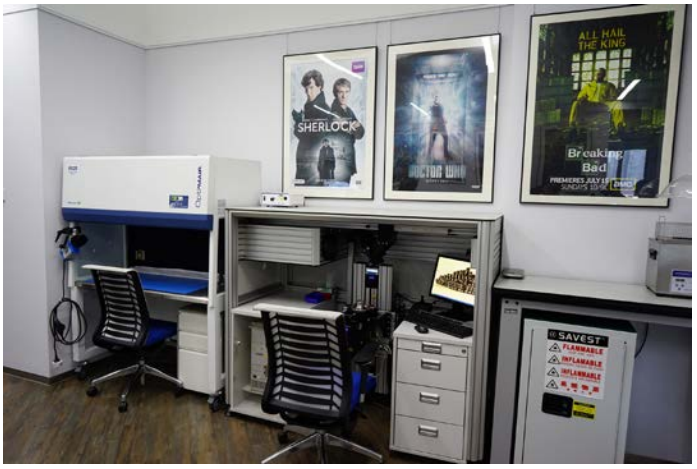
"These charts are something every rental house could have, eventually. In addition to their projectors. It is used by testing laboratories. The charts are available in Germany from Image Engineering." www.image-engineering.de

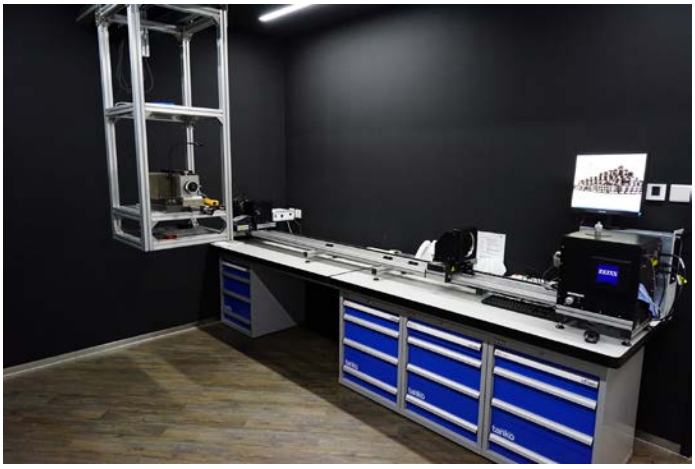
ZEISS Service Department

Christian Cramer, Head of ZEISS Camera Lens Customer Care Division—with a rogue's gallery of "lenses we have seen." Christian is overseeing new initiatives at ZEISS like KPI (Key Performance Index - Customer Feedback) and CRM (Customer Relations Management). Customer Care with real-time phone support is now available. Service in Oberkochen and at authorized ZEISS service centers worldwide is faster and more efficient.

Above: Service area at ZEISS Headquarters in Oberkochen. Below left: service technicians from around the world get lens repair training in the classroom on site. Below right: cutways of lenses in the classroom.

ZEISS Worldwide Service at ARRI China





What did the Roman fort in Aalen two centuries ago (near ZEISS headquarters today) have in common with ZEISS Authorized Service Stations worldwide? They share a common design, with the same equipment and the same layout. This is reassuring: no matter where in the world you're shooting, factory-authorized service is not far away.

Go to AbelCine's ZEISS cine lens repair facility in Burbank or New York, or NAC's station in Tokyo, or ARRI China's new facility in Beijing—they all look similar, with the same test equipment, tools and training we've seen at ZEISS headquarters in Oberkochen. After the opening of the new Authorized Service Station in China, Christian Cramer wrote, "At the event on July 2nd. Foresti Liu and I talked about the the cooperation of ARRI China, ARRI and ZEISS, and about the importance of local service within China. We officially unveiled the ZEISS Authorized Service Center badge. The event was well attended by more than 80-100 customers, DPs, Rental Houses and Film School Representatives. Presentations covered the Ultra Prime and Master Prime lens families (by Christian Cramer), CZ.2 and CP.2 lens families (by Arato Ogura), and the complete ARRI/ZEISS lens line-up (by Thorsten Meywald). ARRI China is now the official Service contact for all ARRI/ZEISS customers in China. All Cine lenses sold by ZEISS directly (CZ.2 and CP.2 series) will also be repaired. Turnaround time can be faster, and technicians provide support in the local language."

Note that ZEISS and AbelCine offer certification courses for technicians and camera assistants. For more details on ZEISS service: *tiny.cc/zeiss-service*

At the opening of the ZEISS Authorized Service Facility at ARRI China in Beijing. Clockwise from top left: 1. Clean Air Workstation and K8 MTF Tester. 2. K9 Tester and Lens Projector. 3. Opening Day—standing, left to right: Bryce Yu (ARRI Asia), Arato Ogura (ZEISS), Thorsten Meywald (ARRI), Sylvan Liu (ARRI China), Simon Sommer (ZEISS), Christian Cramer (ZEISS), Forest Liu (ARRI China), Winter Liu (ARRI China), John Zhong (ARRI China). Front row, left to right: Olivia Liu (ARRI China) , Emily Huang (ARRI China), Sophia Zhang (ARRI China), Tiger Kang (ARRI China).

AbelCine ZEISS Warranty Service Center

Jeff Marzigliano, Lens Technician; Rich Abel, Vice-President / COO AbelCine

Lens Technician at AbelCine Burbank

Nathaniel Bonini, Director of Services; Jeff Marzigliano at AbelCine New York

AbelCine became an authorized ZEISS Service Center in 2011. They joined the other Carl Zeiss service centers worldwide where you can have your ZEISS lenses repaired with the same equipment and procedures used at the factory. The other centers are NAC in Japan, ARRI China in Beijing and, of course, Carl Zeiss headquarters in Oberkochen, Germany.

ZEISS appointed AbelCine a Carl Zeiss Authorized Service Partner. As a factory trained, authorized and equipped warranty service center, AbelCine is equipped to repair ZEISS lenses. Becoming an authorized service center is a multi-level process. Abel first installed the latest K8 MTF test equipment and specialized tools in their Burbank office, enabling them to handle the vast majority of service jobs. They sent lens technicians for training in Oberkochen.

Additional test equipment to be installed later this year, including the K9 On-Axis MTF Tester, will enable AbelCine to achieve top level authorization status. Technicians and test equipment will be evaluated at regular intervals to uphold the factory's level of precision and workmanship.

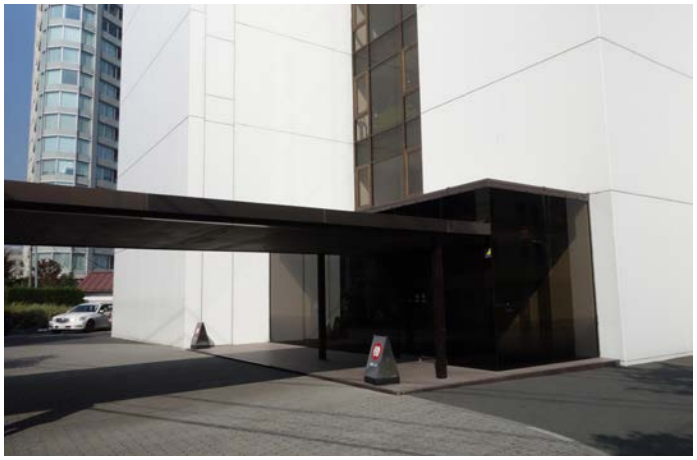
Carl Zeiss points out that the authorized service partner marks the next step in the expansion of their service program, for which, in principle, every dealer and service provider active in the cine industry could apply and qualify.

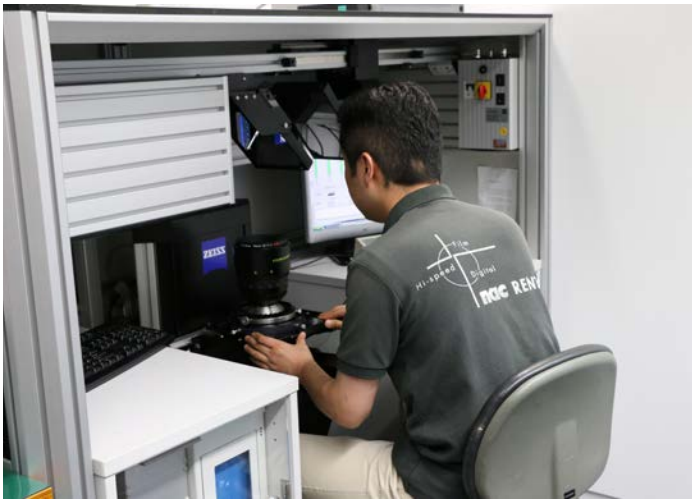
AbelCine has offices in New York City, Burbank and Chicago. www.abelcine.com

The K8 MTF tester at NAC in Japan, above, is the same one developed and used at the factory and by AbelCine in Burbank.

Below: At NAC, a ZEISS Ultra Prime is disassembled and labeled for training.

NAC Image Technology ZEISS Service





NAC Image Technology is a prominent Tokyo company with a rich history. They are the ARRI Distributor in Japan, major camera rental house, high-tech manufacturer of high speed cameras and optical products, and authorized ZEISS service center.

The company was founded in 1958 in the Ginza area of Tokyo by the father of the current President, Mr. Seiji Nakajima. Today, a team of 200 people work at facilities in Tokyo, Yokohama, Osaka, Nagoya, and Fukuoka. Mr. Nakijima explained that the company's philosophy is defined by a Japanese character that means "Master Artisan and Artist."

NAC has always prided itself on listening to customers' requests. Early on, they modified existing equipment, created anamorphic lenses, and customized cameras. They specialized in 8-perf VistaVision and high-speed film cameras. During the Tokyo Olympics, they supplied the cameras for director Kon Ichikawa. The list goes on.

I visited NAC's Tokyo rental and repair facility. Their optical department is one of two authorized in the world authorized by ZEISS. AbelCine is the other. NAC owns a ZEISS K8 MTF tester and has the complete line of ZEISS lens tools and spare parts. Most Ultra Prime and Master Prime lenses require special gripping tools to unscrew the barrels, and NAC has an entire cabinet full of these tools. www.nacinc.com

ZEISS Japan

ZEISS has maintained offices in Japan for more than 100 years. In 1877, the first compound microscope was delivered to Tokyo. Admiral Togo famously used ZEISS binoculars (with a rotating eyepiece turret that provided two magnifactions) during the Russo-Japanese War (1904-1905). The company's strategic partnerships and connections in Japan continue to this day. ZEISS lenses are featured on many Sony products.

Left to right, in front of the ZEISS building: Mr. Shin Yoneyama (Int'l Project Mgr), Mr. Hideo Yamazaki, (Division Mgr), Ms. Masako Misaki (Marcom), Mr. Arato Ogura, (Regional Sales Mgr, Cine), and Mr. Ken Nagate (Senior Sales Mgr).

ZEISS Japan Headquarters in Tokyo.

Arato Ogura at the ZEISS booth in InterBEE.

Shin Yoneyama, Masako Misaki, and Arato Ogura at InterBEE. Michael Schiehlen, Director of Sales, appears on the wall monitor.

Below: ZEISS Touit 32 mm f/1.8 lens for mirrorless Sony E mount (NEX) and Fujifilm X mount APS-C cameras.

ZEISS Touit 50 mm f/2.8 Makro-Planar is designed for E and X mount mirrorless APS-C-cameras. However, it can be used on the new Sony A7 full-frame camera which scales the 1.6x crop factor to fill the finder.

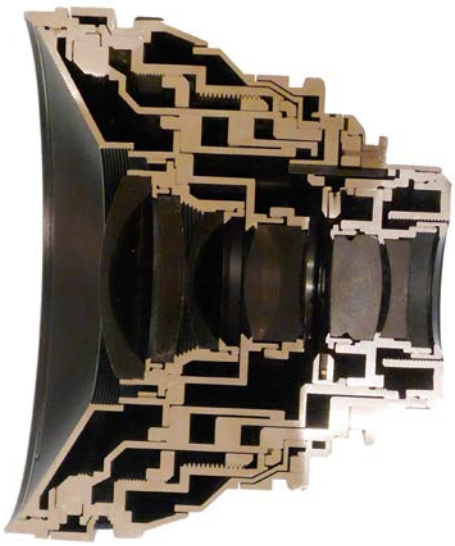
Cutaway Views

If there are more Michelin starred restaurants in Tokyo than any other city, it is even more astonishing how the quintessential French macaron manages to be more ubiquitous here than Paris. In many shops, these macarons are delicately dissected and displayed to reveal their tempting centers. They remind me of Nathan Myhrvold's *Photography of Modernist Cuisine,* whose pictures reveal the beauty of deconstructed food with dazzling cutaway views, much like the lens cutaways at the bottom of this page.

Imperial Hotel Teppanyaki Kamon

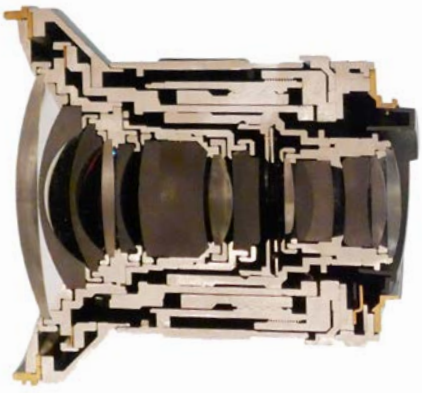
ZEISS Cutaways

These restaurant pages were encouraged by Mr. Arato Ogura (opposite), ZEISS Regional Sales Manager, Camera Lens Department, Cinema Products. The last ZEISS Cine Lens Day in Oberkochen was conducted in a cooking school, the better to demonstrate the correlation between punctilious preparation of food and the meticulous manufacturing of lenses.



Cine Style:
Cutaway of ZEISS
25 mm T2.9
Compact Prime
with PL mount

SLR Style:
Cutaway of ZEISS
21 mm F/2.8
ZF Lens with
Nikon F-Mount



ZEISS Compact Zooms

These are the only cine-style zooms that I know of with full-frame coverage, 24x36 mm. Therefore, there is no vignetting or shading on any of the ever-growing list of image sensors larger than Super 35 (image diagonal 31.5 mm). All three Compact Zooms are high resolution.

ZEISS will show a working prototype of their wide-angle 15-30 mm T2.9 Full Frame Compact Cine Zoom at NAB. The official title is Compact Zoom CZ.2 15-30/T2.9. It is the third member of the Compact Zoom family and will ship this summer. Price is around € 17,900 or US$ 23,900 (not including tax).

Images from the 15-30 mm zoom are free of distortion. Straight lines remain straight. You can use this wide-angle zoom for architectural shots, critical VFX plates, composite backgrounds, wide-angle close-ups, or far and wide establishing shots: EXT. FOOTBALL STADIUM - NIGHT.

The 15-30 mm T2.9 joins the two other members of the CZ.2 Compact Zoom family already in production and highly successful worldwide: 28-80 mm T2.9 and 70-200 mm T2.9.

Several things make these zoom lenses unique: full frame, outstanding contrast and very high resolution, quality, and versatility.

They cover up to full frame 24x36 mm (43.3 diameter image circle.) That means the RED Dragon 6K sensor is amply covered, along with any other larger formats camera manufacturers conjure up. The ZEISS Compact Zooms keep you reasonably future proof.

Speaking off the record, several respected sources seem convinced that motion picture cameras will wind up with scalable 24x36 mm sensors. That's not to say the vast arsenal of 35mm PL 18x24 mm format lenses will be abandoned—they will simply be attached with interchangeable lens mounts. (See Sony F55, Sony A7R, Leica M.)

Elsewhere in this edition, we write about the new norm in episodic television for ever faster production schedules and not having time to change lenses. A family of 3 CZ.2 Compact Zooms would cover focal lengths from 15 to 200 mm.

Because the CZ.2 Compact Zooms are ZEISS color-matched, they can be used in combination with ARRI/ZEISS Master Primes, ARRI/ZEISS Ultra Primes and ZEISS Compact Primes should not require additional color grading in post production to match.

All 3 zooms have a T2.9 maximum aperture. The idea of using zoom lenses at night would have been horrifying a few years ago—but no more. Sensitive cameras shooting at high ISOs make T2.9 the new nighttime T1.3.

The zooms are protected against dust and spray.

They use an interchangeable mount system (IMS), currently available in 5 different mounts: PL, EF, F, MFT and E.

www.zeiss.com/cine

ZEISS CP.2, CZ.2, Z, Otus, Master, Ultra...

As we converge in cinema and stills, motion picture practitioners are eying still photography lenses, and still shooters are trying cine lenses. The Cine Lenses include: ZEISS CP.2 Compact Primes and CZ.2 Compact Zooms, ARRI/ZEISS Ultra Primes, Master Primes and Master Anamorphics. SLR lenses include the new high-performance, full-frame Otus 55 mm f/1.4 in ZE and ZF mount. (ZF is the one with the manual/automatic iris ring; ZE is the model with auto-iris only, no ring visible.)

Below is a partial preview of the ZEISS family, not to scale.

ZEISS CP.2 Compact Prime Full Frame Lenses (PL, EF, F, E and MFT mounts)

ARRI/ZEISS Master Anamorphic T1.9 Set

ZEISS CZ.2 Compact Zooms

ARRI/ZEISS Master Prime T1.3 Set

ARRI/ZEISS Ultra Prime T1.9 Lens Set (8R = T2.8. 10 mm = T2.1. 12mm = T2.0)

ZEISS SLR Series: ZF.2 (Nikon F mount, shown here), ZE (Canon EF mount), ZA (Sony Alpha) lenses for full frame SLR cameras.

ZEISS Otus 55mm f/1.4 in ZE and ZF mounts for full frame SLR cameras

Otus ZE (Canon) mount

Otus ZF.2 (Nikon) mount

ZEISS CP.2 and CZ.2 Lenses

The Carl Zeiss family of Compact Prime CP.2 and Compact Zoom CZ.2 Lenses cover Full Frame (FF) 24 x 36 mm come with five interchangeable mounts: PL, EF, F, E and MFT. They cover full frame still 24 x 36 mm format (except CP.2 18 mm which covers APS-H). www.zeiss.com/cine

Compact Prime CP.2 Lenses

Lens	Aperture	Close Focus [1]	Length [2]	Front Diameter	Weight
15 mm	T 2.9 to T 22	0.3 m / 12''	86 mm / 3.39''	114 mm / 4.5''	0.9 kg / 2.0 lb
18 mm	T 3.6 to T 22	0.3 m / 12''	80 mm / 3.15''	114 mm / 4.5''	0.9 kg / 2.0 lb
21 mm	T 2.9 to T 22	0.24 m / 10''	80 mm / 3.15''	114 mm / 4.5''	1.0 kg / 2.2 lb
25 mm T 2.1	T 2.1 to T 22	0.26 m / 10''	80 mm / 3.15''	114 mm / 4.5''	0.9 kg / 2.0 lb
28 mm	T 2.1 to T 22	0.24 m / 10''	80 mm / 3.15''	114 mm / 4.5''	1.0 kg / 2.2 lb
35 mm	T 2.1 to T 22	0.3 m / 12''	80 mm / 3.15''	114 mm / 4.5''	1.0 kg / 2.2 lb
50 mm	T 2.1 to T 22	0.45 m / 18''	80 mm / 3.15''	114 mm / 4.5''	0.9 kg / 2.0 lb
50 mm Macro	T 2.1 to T 22	0.24 m / 10''	132 mm / 5.19''	134 mm / 5.3''	1.4 kg / 3.0 lb
85 mm	T 2.1 to T 22	1 m / 3'3''	80 mm / 3.15''	114 mm / 4.5''	0.9 kg / 2.0 lb
100 mm	T 2.1 to T 22	0.7 m / 2'6''	132 mm / 5.19''	114 mm / 4.5''	1.5 kg / 3.3 lb
135 mm	T 2.1 to T 22	1 m / 3'3''	149 mm / 5.86''	114 mm / 4.5''	1.6 kg / 3.5 lb

Compact Prime CP.2 Super Speed Lenses

Lens	Aperture	Close Focus [1]	Length [2]	Front Diameter	Weight
35 mm	T 1.5 to T 22	0.3 m / 12''	91 mm / 3.58''	114 mm / 4.5''	1.1 kg / 2.4 lb
50 mm	T 1.5 to T 22	0.45 m / 18''	80 mm / 3.15''	114 mm / 4.5''	0.9 kg / 2.0 lb
85 mm	T 1.5 to T 22	1 m / 3'3''	80 mm / 3.15''	114 mm / 4.5''	0.9 kg / 2.0 lb

Compact Zoom CZ.2 Lenses

15-30 mm

28-80 mm

70-200 mm

Lens	Aperture	Close Focus [1]	Length [2]	Front Diameter	Weight
15-30 mm	T 2.9 to T 22	0.55 m / 1'10"	252 mm / 9.92"	114 mm / 4.5"	2.6 kg / 5.7 lb
28-80 mm	T 2.9 to T 22	0.83 m / 2'8"	196 mm / 7.72"	95 mm / 3.7"	2.5 kg / 5.5 lb
70-200 mm	T 2.9 to T 22	1.52 m / 5'	250 mm / 9.84"	95 mm / 3.7"	2.8 kg / 6.2 lb

[1] Close focus distance (MOD) is measured from the image plane
[2] Front to PL mount flange

ARRRI/ZEISS Master Anamorphics

The Magnificent Seven (1960) was a 35mm anamorphic film directed by John Sturges. A remake of Akira Kurosawa's *The Seven Samurai*, it starred Yul Brynner, Eli Wallach, Steve McQueen, Charles Bronson, James Coburn, and a young John A. Alonzo, before he became a cinematographer (John A. Alonzo, ASC).

There are seven magnificent new ARRI/Zeiss Master Anamorphic prime lenses for 35mm format digital and film cameras.

They are compact, lightweight, and high speed (T1.9). They exhibit minimal distortion: straight lines remain straight, even at close focus. The iris consists of 15 blades, so bokehs are smooth and anamorphically oval. Focus barrels can be ordered in feet or meters.

ARRRI/ZEISS Master Anamorphic Prime Lenses

Focal Length	**35 mm**	**40 mm**	**50 mm**	**60 mm**	**75 mm**	**100 mm**	**135 mm**
Aperture	T1.9 - T22	T1.9 - T22	T1.9 - T22	T1.9 - T22	T1.9 - T22	T1.9 - T22	T1.9 - T22
Lens Mount (1)	PL LDS	PL LDS	PL LDS	PL LDS	PL LDS	PL LDS	PL LDS
Close Focus (fr. image plane)	0.75 m / 2'6"	0.70 m / 2'4"	0.75 m / 2'6"	0.90 m / 3'	0.90 m / 3'	0.95 m / 3'1''	1.20 m / 3'11''
Length (from lens flange)	183 mm / 7.2"	183 mm / 7.2"	183 mm / 7.2"	183 mm / 7.2"	183 mm / 7.2"	210 mm / 8.1''	237 mm / 9.3''
Length (from image plane)	235 mm / 9.3"	235 mm / 9.3"	235 mm / 9.3"	235 mm / 9.3"	235 mm / 9.3"	262 mm / 10.2''	289 mm / 11.4''
Front Diameter	95 mm / 3.7"	95 mm / 3.7"	95 mm / 3.7"	95 mm / 3.7"	95 mm / 3.7"	95 mm / 3.7"	95 mm / 3.7"
Widest Barrel Diameter	114 mm / 4.5"	114 mm / 4.5"	114 mm / 4.5"	114 mm / 4.5"	114 mm / 4.5"	114 mm / 4.5"	114 mm / 4.5"
Weight	2.6 kg / 5.7 lb	2.7 kg / 6 lb	2.6 kg / 5.7 lb	2.7 kg / 6 lb	2.6 kg / 5.7 lb	3.1 kg / 6.8 lb	3.7 kg / 8.2 lb
Image circle	29.26 mm	29.26 mm	29.26 mm	29.26 mm	29.26 mm	29.26 mm	29.26 mm
Entrance Pupil (mm) (2)	178.7	176.9	171.5	152.2	136.7	145.9	129.3
Entrance Pupil (inches) (2)	7.040	6.929	6.75	5.984	5.380	5.709	5.091
Angle of view H - V Super 35 'Scope format (3)	65.47° - 29.91°	58.72° - 26.31°	48.46° - 21.18°	41.11° - 17.71°	33.40° - 14.21°	25.36° - 10.68°	18.92° - 7.92°

(1) PL Mount is 54 mm diameter, stainless steel, with Lens Data System (LDS) contacts.

(2) The distance from the entrance pupil relative to the film/sensor plane at infinity focus.

(3) Horizontal (H) and vertical (V) angles of view for a Super 35 Cinemascope format camera aperture (22.5 mm x 18.7 mm / 0.8858" x 0.7362").

ARRI/ZEISS Master Anamorphics

The ARRI/ZEISS Master Anamorphic family made its debut at IBC Amsterdam in September 2012 with a 50 mm T1.9. The MA 35 mm T1.9 and 75 mm T1.9 were unveiled at NAB 2013, followed by the 100 mm T1.9 at IBC 2013, then the 40 mm T1.9 and 60 mm T1.9 at ZEISS Cine Lens Day in November 2013. The family will be complete when the MA 135 mm T1.9 is presented at NAB 2014. (Lens sets are rarely "complete." DPs, like Oliver Twist, always ask for more.)

ARRI/ZEISS Master Anamorphic lenses have an innovative optical design, with almost no breathing and minimal distortion. Anamorphic "mumps" (faces looking wider in close-ups) is automatically compensated by careful positioning of the cylindrical lens elements. There are 4 to 8 cylindrical elements in each lens. The optical design reduces chromatic aberrations and shading (darkening) at the corners of the image. Master Anamorphic lenses produce a smooth anamorphic bokeh, free of artifacts. The 15-blade iris helps create a bokeh that is elliptical (oval) and consistently illuminated. See the framegrabs (opposite page).

The lenses are compact, light, and have a fast aperture of T1.9 at all focal lengths. They are typically "ZEISS" with reliable and durable mechanical construction. Improved protection against dust and spray means less downtime and fewer repairs.

The ARRI/ZEISS Master Anamorphic lenses herald the return to an era of anamorphic big-screen productions at a new, previously unseen, level of quality.

ARRI/ZEISS Master Anamorphic lenses were developed by ARRI and ZEISS, manufactured by ZEISS, and exclusively distributed by ARRI. So far, about 50 mini-sets (MA35, 50, 75) have been delivered to customers, with many more orders placed. The MA100 is shipping now, and the MA40 and MA60 ship around the end of March. The MA135 will follow after NAB.

www.zeiss.com/cine
www.arri.com

Oval bokehs can be anticipated if the iris looks elliptical when viewed through the front of the lens.

Newest member of the Master Anamorphic family: 135 mm T1.9

ARRI/ZEISS Master Anamorphic Framegrabs

Sheng Lu
"I See"
(China)
MA 50 mm

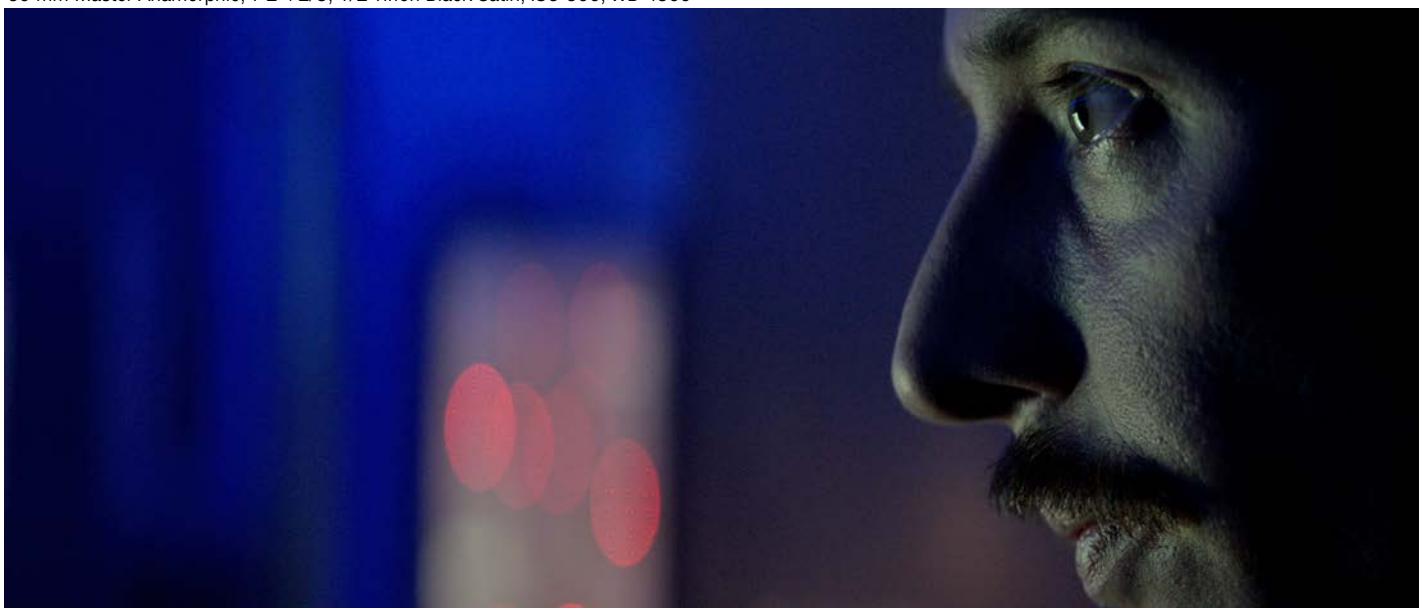
Stijn van der Veken, SBC
"In Flanders Fields"
(Belgium)
MA 35 mm

Michel Abramowicz, AFC
"A trip to remember"
(France)
MA 50 mm

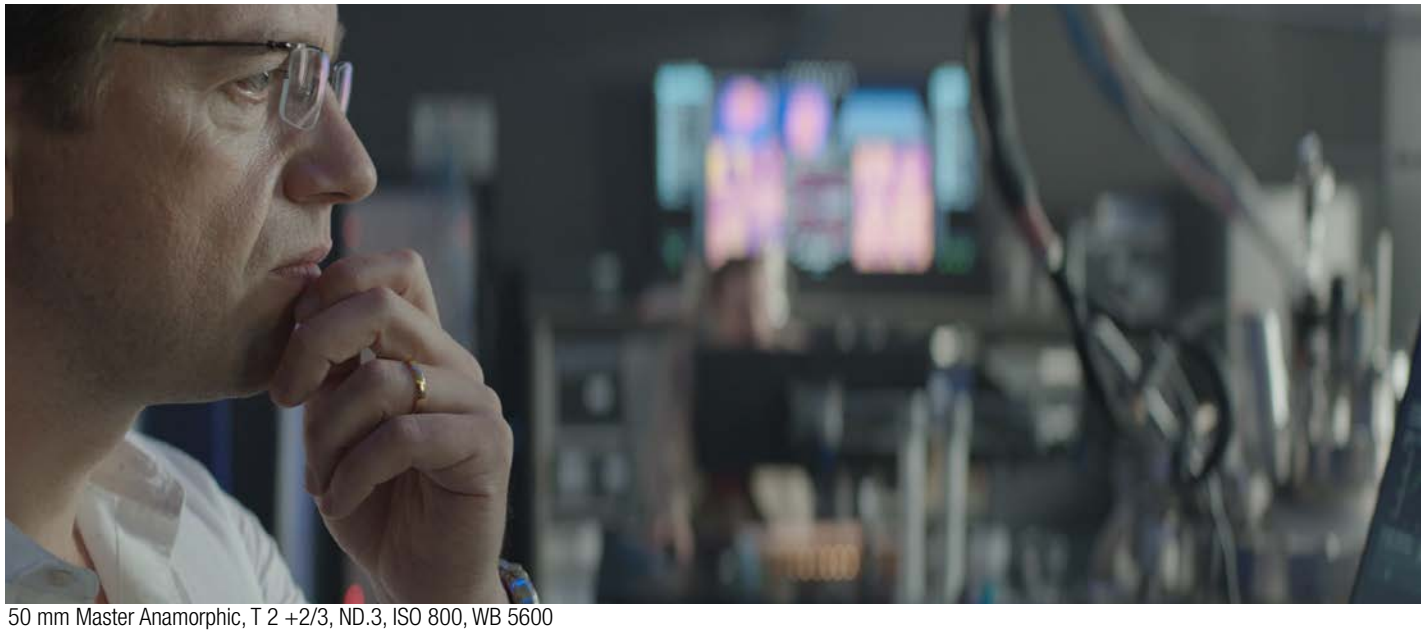
Michel Abramowicz, AFC
"A trip to remember"
(France)
MA 50 mm at close focus

ARRI/ZEISS Master Anamorphics

60 mm Master Anamorphic, T 2 +2/3, 1/2 Tiffen Black Satin, ISO 800, WB 4300



60 mm Master Anamorphic, T2 +2/3,1/2 Black Satin, ISO 800, WB 5600



50 mm Master Anamorphic, T 2 +2/3, ND.3, ISO 800, WB 5600

Stijn Van der Veken with Master Anamorphics

Alles Voor Lena (The Sum of Histories)

Production company: Caviar Belgium
Producer: Frank Van Passel
Director: Lukas Bossuyt
DP: Stijn Van der Veken, ASC, SBC

Technical info:
ARRI ALEXA XT – ArriRaw

ARRI / ZEISS Master Anamorphic lenses
Cooke S2 spherical lenses rehoused by True Lens Services (TLS) UK
Codex Action Cam on Codex RAW
Lucky Camera Brussels - rental company

The year is 2040. Professor Viktor (Koen De Graeve) discovers a way to send emails back in time. Using the Casimir effect (quantum field theory in which the space between micro-objects can attract each other) he tries to fight for his beloved Lena. But the past isn't easy to manipulate and every small intervention can have far-reaching consequences to the present—something that Viktor soon discovers. The *Sum of Histories* is a love story with a touch of sci-fi. Cinematographer Stijn Van der Veken, ASC, SBC explained his creative choices.

"The story happens 35% in the present and 65% in the future (2040). The Director wanted a light, romantic, "vintage" feel for the present ,which brought me to use old Cooke S2 lenses because of their warm, slightly soft and imperfect performance. We have a set rehoused by True Lens Services in England.

"For the future scenes we went for a set of ARRI/ZEISS Master Anamorphic lenses. They have a fabulous bokeh, a unique look—smoother than Master Prime lenses, and still an amazing and powerful image all the way open to T1.9. We have a set of six MA lenses, from 35 to 100 mm.

"A lot of people consider anamorphics mainly for artifacts. For me, shooting a movie is an artistic opportunity to use lenses in all conditions. We did a night shoot in a park, under difficult conditions, available night light, no practicals. I call it lighting with milligrams. Many lenses cannot handle these extreme, low light, contrasty conditions. However, like Master Primes, the Master Anamorphics maintained quality all the way to T1.9. As I said before, Master Anamorphics are smoother, a little gentler on faces than Master Primes. On MCU or CU shots, I'll soften them a little with Tiffen ½ Black Satin diffusion—which Kees van Oostrum, ASC recommended to me.

"I am a big fan of anamorphic, especially because of the way the focus falls off—which is the narrative aspect of the lenses. Their best performance for me in terms of storytelling for the main characters is situated between 3 and 6 feet, depending on the lens.

"A lot of people try to create their look in grading, but I rather set my look on the set. I don't like to put looks in grading—for me, that seems too artificial. I achieve the look with lenses and lighting."

Stijn is shooting Arriraw on ARRI ALEXA. They have one LUT: the same one is used on set, for viewing and editing. This LUT then becomes the starting point for grading. It's a custom LUT derived from the ARRI Low Con LUT with the same saturation, and. as Stijn calls it, "a bit more bite."

Flair with Flare: Master Anamorphic Flare Sets

Master Anamorphic Flare Sets add character and quirks.

Each of the 7 ARRI/ZEISS Master Anamorphic lenses gets its own individual and easily replaceable front and rear glass elements. They can be used individually or in combination. This results in 4 Master Ana permutations: no flares, front flare element only, rear only, and combination front and rear.

When the Master Anamorphics were introduced in 2013, you could almost hear the collective cry of cinematographers for more aberrations, flares, veiling glare—all the stuff that the scientists at ZEISS and ARRI worked so hard to eliminate. In the meantime, for many the pendulum has swung back to a more pristine look and the Master Anamorphics are working hard on features worldwide.

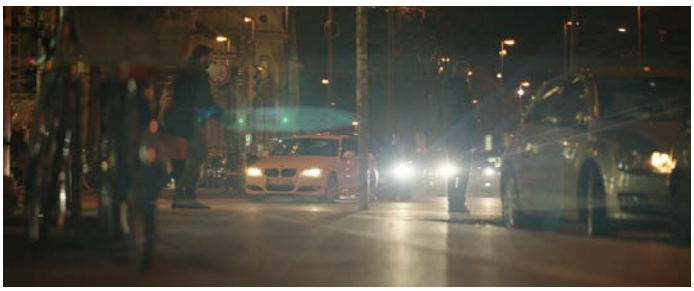
Still, the Master Anamorphic Flare Set is an essential toolkit, providing a range of customizable looks that can be tailored to individual style, story, and situation. As Zero Mostel said, "Something for everyone."

The front and rear glass elements of each Flare Set have a special lens coating that enhances flaring, ghosting and veiling glare. These effects are consistent across all of the Flare Sets. You can control the aberrations by changing the lens aperture or positioning extra flare lights out of frame (Maglights attached to matte-box aiming into the lens). The Master Anamorphics retain their resolution, lack of distortion and corner-to-corner optical performance even with the Flare Sets attached.

An ARRI Master Anamorphic Toolkit (purchased separately) is used to exchange the front and rear optical elements. It only takes a few minutes: each flare element is pre-aligned in a metal frame.

With the Master Anamorphic Flare Kits, a set of Master Anamorphics multiplies and essentially becomes four different sets, each with different characteristics, yet still free of curved horizons, focus breathing, mumps, barrel and pincushion distortion.

ARRI: C4337 arri.com
ZEISS: C9543 zeiss.comm/cine



Flare Set framegrabs from demo short shot by Tom Fährmann, BVK
Opposite: AUWZ framegrabs from Jonathan Yi's demo short

ZEISS Cine Lens Day Jena 2013

by Danys Bruyere, Deputy Managing Director, TSF

November 13-14, 2013. It was an honor to be invited to the ZEISS Cine Lens Day, a biannual gathering for clients and partners to learn how ZEISS cinema lenses are made. This year's event was held in Jena, Germany—one of their two main manufacturing sites for cine lenses. (The other is Oberkochen, where the last Cine Lens Day was held.)

It lasted for two glorious days in different venues in Jena, the city where Carl Zeiss opened his first microscope repair and design shop, next to the prestigious Friedrich-Schiller-Universität.

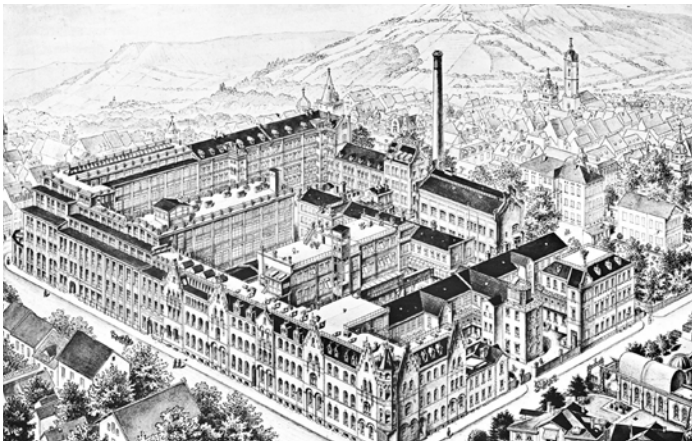
Every detail of our visit was carefully planned. We were greeted by the organizers and whisked off to the Carl Zeiss Planetarium, where an elegant get-together was set up under the simulated stars of the planetarium's digital projection systems. Wining and dining were punctuated by presentations and announcements from both ZEISS and ARRI. As we know, ARRI has a long standing partnership in both the creation and commercialisation of ZEISS manufactured lenses. The dinner was a great time to meet up with colleagues from the rental world, the kind team from ZEISS, distributors, and the fortunate cinematographers who have worked closely with ZEISS and with their new lenses.

Of the evening announcements, one that really stood out was the presentation of a complete line of compact zooms. The new 15-30 mm CZ.2 completes a comprehensive range that also includes the 28-80 mm and the popular 70-200 mm. The three zooms are all ergonomically coherent with common focus, iris and zoom gear positioning, and T-stops of T2.9. The 15-30 has a front diameter of 114 mm, and the 28-80 and 70-200 mm zooms have 95 mm front diameters. All three lenses cover the full 35mm still format (24x36), making them the only full set of zooms designed for cinema that cover the larger sensors so dear to our "cinephotographer" friends.

The second major announcement of the evening related to the Master Anamorphics. The first partial sets of lenses (35, 50 and 75 mm) have started shipping. The 40 and 100 mm will be delivered in the very near future. The remaining lenses (60 and 135 mm) will be delivered in the first quarter of 2014, therefore fulfilling the plans for ARRI and ZEISS to have the initial full sets ready for NAB 2014. This is a milestone I must admit I was quite skeptical about. This is a real feat in manufacturing when you consider the complexity of the design of the Master Anamorphics.

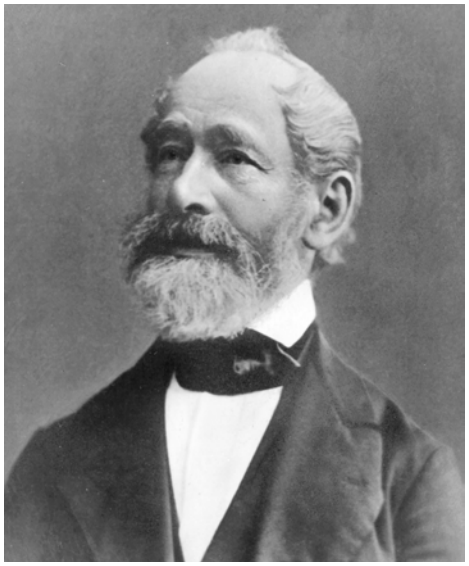
The third major announcement made by Dr. Aurelian Dodoc (Principal Scientist, ZEISS Camera Lenses) was that this initial set of 7 lenses will be augmented by a two additional focal lengths. There will be a wider focal length and a longer one, bringing the set to 9 lenses, which, from 15 years of experience in renting anamorphic lenses, seems to be a reasonable set of primes to shoot almost any production. Although the focal lengths were not yet specified, if I were a gambling man (which I am not), I would bet on a 150 mm and a 32 mm, based on the horizontal and vertical calculations (150/75 and 32/16) of existing Master Prime lenses. Pure speculation on my part.

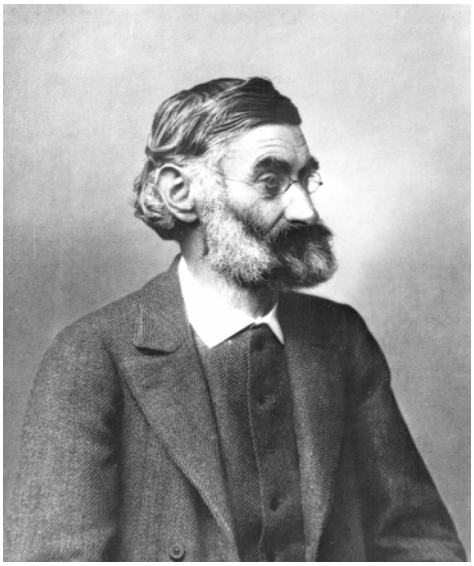
Jena, Germany

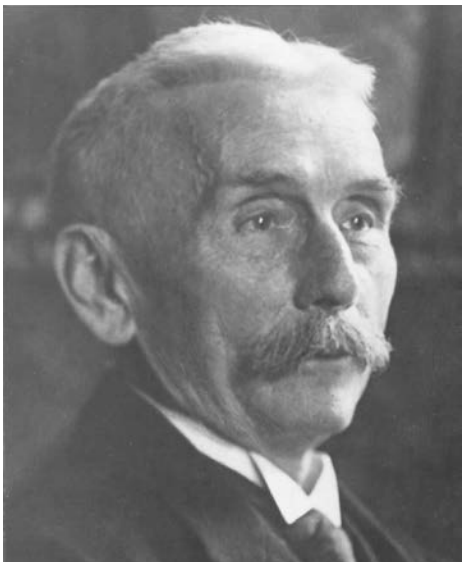


Clockwise from above: 1. Jena today with view toward the University and ZEISS. 2. Jena and ZEISS 1908. 3. Door plaque. 4. Replica of the Carl Zeiss workshop, in the Jena Optical Museum as it would have looked in 1860. Carl Zeiss supervised from his office perch on a raised platform.

Zeiss, Abbe, and Schott







Carl Zeiss (1816-1888) was born in Weimar, the fifth of twelve children. From 1835 to 1838, he attended lectures at the University of Jena. In 1846, Zeiss set up a small workshop in Jena to build and maintain scientific instruments and microscopes at the University. Like his successful contemporaries of the industrial revolution, Carl Zeiss recognized the importance of science, precision and mass production in the manufacturing process. After Carl Zeiss died, Ernst Abbe became the owner of the company.

Ernst Karl Abbe (1840-1905), professor of mathematics and physics at the University of Jena, joined Carl Zeiss in 1866. He replaced the trial and error manufacturing process with a scientific approach based on math and physics. Abbe is also remembered as a social reformer. In 1889, he restructured the company as a Foundation, and by 1900 established the 8-hour workday, minimum wages, medical coverage and pensions for all workers. All employees share, to this day, in the success of the Zeiss Foundation.

Friedrich Otto Schott (1851-1935) was the third member of the Optical Triumvirate. The son of a window glass maker, Schott received his doctorate at the University of Jena in 1875. His thesis was "Contributions to the Theory and Practice of Glass Fabrication." In 1884, in association with Zeiss and Abbe, he founded Glastechnische Laboratorium Schott & Genossen (Schott & Associates Glass Technology Laboratory) in Jena to produce lenses for Zeiss's microscopes and optical equipment.

Dr. Winfried Scherle Interview October 2013

Dr. Winfried Scherle is Senior Vice President and General Manager of ZEISS Camera Lenses. We got together in New York before and during PhotoPlus Expo, and continued our discussions by email.

Jon Fauer: How did you get started in optics?

Dr. Winfried Scherle: I have always been fascinated by uncovering things that were previously invisible and by exploring dimensions that were inaccessible. I think this is one of the reasons why I specialized in the physics of electron microscopy. At the German University of Tübingen I developed methods to calculate electromagnetic lenses for electron microscopes. At one point ZEISS was interested in taking over one of my methods and I decided to join the company to implement it into their technology.

Was ZEISS your first job out of university?

ZEISS was my first and only job after I left university. I can say that I'm highly committed to the company and therefore it is the only company I have worked for in my career. The most important reason for me is that ZEISS as a foundation is able to follow a long-term plan and strategy. All revenue It generates can be reinvested. That allows us to act reliably, innovate continuously and keep our customer in the focus of our decisions. I'm proud to say that our scientific research and development has enabled the work of many Nobel Prize winners.

How did Jena become such a significant lens manufacturing city—almost the center of the universe for optics?

In 1846, Carl Zeiss, an entrepreneur and the founder of our company, opened a workshop in Jena, Germany to repair optical instruments for the University of Jena and to build microscopes. At that time there were no mathematical equations available for the consistent production of lenses, so Carl Zeiss specialists manufactured microscope lenses by trial and error. They would build, test, and if it wasn't good enough, then they would try it again. But there was no clear or consistent procedure. Nevertheless, Zeiss's microscopes were good. As the business grew, he became frustrated with the poor yield and waste caused by the random process. In order to achieve higher reliability, he partnered with Ernst Abbe, a leading scientist at the University of Jena. Their combined efforts led to the discovery of what is known as the "Abbe sine condition", an equation for a lens to produce sharp images off-axis as well as on-axis. This enabled the specialists to define the shape of a lens before its creation and greatly improved the way lenses could be made.

Jena's international reputation as an optical center was created in the 19th century by a fortuitous constellation of personalities centered at the university. Zeiss's precision optical engineering workshop and the glassworks Schott & Gen. came about almost as spin-off enterprises from their Alma Mater—much in the same way that science, education and the business world dovetail in contemporary Germany.

Otto Schott, who received his doctorate at Jena in 1875, was the third to enter into this alliance by founding, at the instigation of Abbe and Zeiss, a "Laboratory for Glass Technology" in 1884, to produce the first pure optical glass material. This enabled them to produce special lenses for Zeiss's microscopes and optical equipment. That's how Jena and the University became the "Holy Place of Optics." Today, after more than 160 years, the ZEISS group of companies is the one of the world's biggest players in optics and enables global technological and scientific progress with its groundbreaking innovations to this very day.

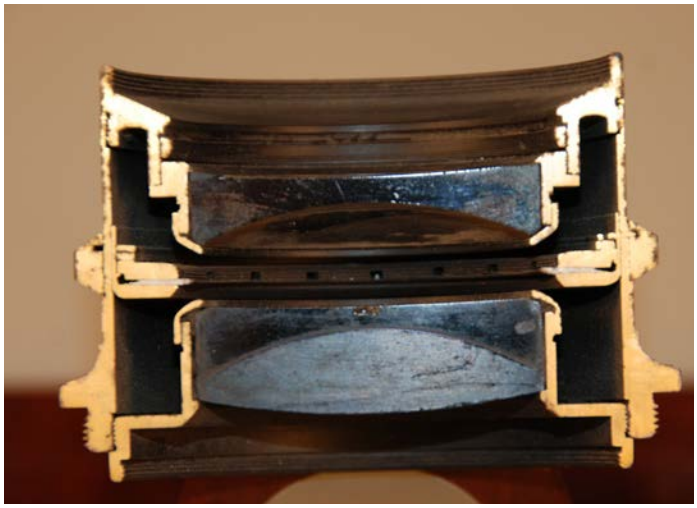
What did Abbe's optical equation actually predict?

Ernst Abbe understood the laws of interaction between light rays and material. An optical ray of a certain wavelength (color) that hits, for example, a glass surface, changes its direction depending on the the rafractive index and dispersion of the dedicated glass material. Abbe's great contribution and the breakthrough for the industry was the ability to make reliable predictions by the use of formulas. Today we use around 150 different types of glass to achieve the performance of our lenses.

When was the first ZEISS cine lens built?

In the beginning the first ZEISS lenses were built for still photography. But because, just like today, they offered the highest performance available, cinematographers began using the still lenses for motion pictures.

One of the first high-end ZEISS camera lens types was the Planar, presented in 1896 – the same year the Lumière Brothers first went on tour with their Cinématographe motion picture camera system. At that time no coatings were available. This created the need for designs with fewer optical elements to reduce the amount of stray light caused by reflections. In 1902, ZEISS pat-



Early Tessar from CARL ZEISS JENA. George Eastman House Collection.

ZEISS Touit (APS-C Sony E and Fujifilm X mounts)

ZEISS Otus (Full Frame Canon EF, Nikon F mounts)

ZEISS Full Frame SLR Lenses (EF and F mounts)

ented a lens with only four elements that would become the most famous camera lens: the Tessar. With its four elements ("tessares" is Greek for "four."), it is a triplet including a cemented doublet for better reduction of chromatic aberration and reflections. The first model was f/6.3. A few years later, an f/4.5 model was available for cinematography and projection. The ZEISS Tessar was fast, very sharp, and led to the design of smaller and more portable cameras—I suppose you could say it enabled mobile photography. More than 150 million Tessar lenses have been produced. After ZEISS invented anti-reflective coatings, the Planar design became even more attractive too—enabling even faster lenses.

History is repeating itself: still lenses used for cinema. What happened next in the history of ZEISS?

The history of ZEISS closely paralleled the history of Germany. After WWII the company was split into Carl Zeiss Jena (East Germany) and Carl Zeiss West Germany. For 44 years there were two ZEISS companies, in two different cities, producing almost the same products.

In West Germany, the business was restarted in Oberkochen (in southwestern Germany) under the name Opton Optische Werke Oberkochen GmbH in 1946, which became Zeiss-Opton Optische Werke Oberkochen GmbH in 1947, but was soon renamed Carl Zeiss. West German Zeiss products were labeled "Opton" for sale in the Eastern bloc, while East German Zeiss products were labeled "Jenoptik" for sale in Western countries.

Following German reunification, VEB Zeiss Jena - deemed one of the few East German firms potentially able to compete at a global level—became Carl Zeiss Jena GmbH, and then was renamed Jenoptik Carl Zeiss Jena GmbH in 1990. In 1991, Jenoptik Carl Zeiss Jena was split in two, with Carl Zeiss AG (Oberkochen) taking over the company's divisions for microscopy and other precision optics (effectively reuniting the pre-war Carl Zeiss enterprise) and moving its microscopy and planetarium divisions back to Jena. To distinguish the company from the founder's name, we capitalize the spelling: ZEISS.

Is Schott a division of ZEISS?

No. When Abbe was getting older, he tried to figure out a way to secure the company for future generations. He was afraid of handing it over to private owners who could take money out of the company for their own personal profit. That's the reason why the "Carl Zeiss Stiftung" (Foundation) was set up. Whatever we earn, we can reinvest in new products. Nobody takes the money out for personal reasons.

Abbe established ZEISS and then the Schott company as part of the Carl Zeiss Foundation. Today the two companies are independent, owned by the Foundation, and each company has its own stock. There's one set of stocks from Carl Zeiss AG and there's another from Schott AG. All the stock is owned by the foundation and cannot be sold.

They operate separately. In the beginning they were very closely related, because optical glass was used for the optical instruments. We now use over 150 different types of glass in our lenses. Today Schott makes a lot of other things. They make ceramics and glassware for all kinds of businesses and households.

Explain the "Stiftung" concept a bit more.

Carl Zeiss Stiftung (Carl Zeiss Foundation) is the owner of Carl Zeiss AG and SCHOTT AG. The primary objectives of the Carl Zeiss Foundation are responsible management and financial security of the companies. The Carl Zeiss Foundation is the sole shareholder. The Foundation achieves its objectives and responsibilities by pursuing specific business activities of the companies, exercising social responsibility, promoting the general interests of the optical and precision engineering industries, and supporting local nonprofit organizations. Furthermore, the Foundation promotes research and education in the fields in which the Foundation companies and their subsidiaries operate.

What is the difference today between the ZEISS companies in Jena and Oberkochen?

Today ZEISS is headquartered in Oberkochen. Jena is the company's second largest site in Germany and hosts many important production departments. For camera lenses, Jena is responsible for the prefabrication of precision parts such as glass elements and key mechanical components. Final assembly and quality control are sited in Oberkochen.

Let's talk about the high-end cinema lenses.

The requirements to be met by these lenses are extremely high. Therefore, we build all cinema lenses in Oberkochen where we have optimal control over the process and the quality level. The still photography SLR lenses like the ZE, ZF and mirror-less lenses are manufactured by production partners in Japan under our direct supervision.

We keep the really high-end products in-house. That includes Master Primes, Master Anamorphics, Ultra Primes, Compact Primes and our new Cinematography Zooms.

Are you still making ARRI/ZEISS Ultra Primes?

Of course. Up to now, we have built approximately 20,000 Ultra Primes. Just last year, we provided around 3,000 new Ultra Prime lenses to the market. Being in the market for around 15 years now, they have gradually become kind of a standard for the industry.

For the absolute top end we continue to offer the Master Prime series - lens # 5,000 was handed over during the last Cine Lens Day. For this product segment, that is a number we are very proud of.

ARRI/ZEISS Master Prime T1.3 Set

ARRI/ZEISS Ultra Prime T1.9 Lens Set (8R is T2.8. 10 mm is T2.1. 12mm is T2.0)

ARRI/ZEISS Master Anamorphic T1.9 Set

What about the ZEISS CP.2 Compact Primes?

This success story started in 2010 when we recognized a demand for professional cine lenses in combination with the latest HDSLR cameras. We modified our DSLR lenses for still photography (ZE, ZF) by adding a dedicated cine housing, narrowing the production tolerances and adding some other features for use with HD video cameras, like a new, extremely round iris and the interchangeable mount. The interchangeable mount system is important because it enables the same lens to be used on different camera systems. Together with their full DSLR format image circles, these lenses are also future-proof when users change their camera body or system—in other words, they are a perfect protection of your investment. Today we offer a set of 14 Compact Primes that have proven their excellence in many different motion picture productions, from corporate films to features and big budget productions.

In general, still lenses require higher specifications in terms of resolution than cinema lenses. Image details of still pictures are analyzed and viewed for a long time. Motion pictures live in the moment and small details are fleeting. Therefore, still lenses generally have to offer higher performance in terms of image quality than motion picture lenses.

And you now have a set of CZ.2 Compact Zooms?

In 2012 we introduced a completely new cine zoom, the Compact Zoom CZ.2 70-200/T2.9. Then we added a 28-80 mm in fall 2012 and a 15-30 mm at the IBC 2013. All three zooms offer the same maximum aperture of T2.9.

The family is designed to be used in combination with all high-end prime lens sets. They feature a completely new optical and mechanical design concept. They also cover the full-frame still format and offer the interchangeable mount system; therefore, they share their name with the Compact Prime lenses. But unlike the Compact Primes, they are not derived from still lenses and therefore offer much more performance and possibilities. Actually, they are in a class of their own and are beginning to be discovered by many more filmmakers.

What was the original concept for these zooms?

Like the Compact Prime lenses the original starting point was adapting DSLR still photography zoom concepts to the special demands of cinematographers.

Unlike the Compact Primes, we discovered during the development process that they would never fulfill customer needs. Still zoom lenses incorporate a varifocal design with associated focal shift, zoom shift and often with aperture ramping. These characteristics are not acceptable for cine applications. What was needed was a brand-new optical and mechanical design that meets the needs of the filmmakers but still offers the advantages of the Compact Primes.

What was the original idea for the Compact Primes?

We saw some filmmakers shooting commercials and videos for YouTube with our DSLR lenses adapted to a video camera. The results didn't look too bad but the workflow was inefficient. We thought it would be much better if we could provide lenses with a real cine style housing so they could use all the established accessories. Their work would be easier and more professional and they'd still have the advantages and quality of a good DSLR lens.

That led to the adaptation of the ZF lens, developing the optics from the DSLR. We added an optimized aperture module with a more rounded iris, provided interchangeable mounts, narrowed the production tolerances and developed a housing with cine-style interfaces that could work on all rigs. Our goal was to provide a series of lenses that provided our customers with the best value for their money..

I think you were the first ones in the industry to do this, and it was a big success.

The Compact Primes where introduced four years ago, and instantly created a new market. In the beginning the success was primarily attributable to the EF (Canon) mount. Now the majority of customers are asking for Compact Primes with a PL mount. So the majority of our lenses are shipped with PL mounts. Tomorrow, new mounts may well become more dominant.

ZEISS CP.2 Compact Prime and CZ.2 Compact Zoom Full Frame Lenses (PL, EF, F, E and MFT mounts)

But customers will be able to adapt their lenses to these systems by simply changing the mount. It is our best-selling cine lens program.

It would be nice if the industry settled on one standardized mount?

I'm a fan of open systems as they offer big benefits for customers. Personally I would like to make things easier for our customers, but going from the feedback we are getting from camera manufacturers, I can say we still have some way to go.

What mount would you recommend?

That's a difficult question. I wouldn't make this decision without the customers involved. I'd invite industry experts like Denny Clairmont, Otto Nementz, and others to incorporate them in the decision process. We need a mechanically very stable mount with an open architecture for future developments in electronic data exchange.

What gave you the idea to do a new set of anamorphic lenses?

That was a very complex decision. We started with a draft lens. It was a 50 mm T1.4 to see what was possible. We looked at what was out there and saw a segment that had not yet been addressed. The challenge was to create something that wasn't just a simple "me too," but that would be truly exceptional, a new benchmark for the industry.

We envisioned building anamorphic lenses with quality that had never been achieved before and would overcome existing boundaries in performance. We went to the market with this draft lens and learned a lot from our many discussions with rental houses, cinematographers, and users. They shot real tests to evaluate the basic concept. For example, we learned that T1.4 was not necessary; that T1.9 would be better, less expensive, and assistants would be happier with the focus. Our customers said, "Reduce the weight, make it smaller, more compact, less expensive. And maybe a size in between an Ultra Prime and a Master Prime."

Based on the discussions, we decided to produce a series of seven lenses. And we will probably expand the range beyond these seven.

As with all other high-end cinematography lenses, we collaborated extensively with ARRI. In parallel, they developed a compatible digital 4:3 sensor that fits the format of these 2x anamorphic lenses. The combination of the ARRI/ZEISS Master Anamorphic lenses and their ARRI Alexa Studio enables filmmakers to achieve image performance never seen before with anamorphic lenses.

At the moment, ARRI Alexa is the only digital camera that can really take proper advantage of 2x anamorphic. Do you see any other companies going to a 4:3 sensor in the future?

I'm convinced this will be a success on its own. But companies like Sony, Canon or RED might adapt and therefore I think it would be only natural for them to provide a 4:3 sensor sooner or later. They have a good understanding of the industry, the implications, and I wouldn't be too surprised if they offered systems in this format.

Why is there so much interest in anamorphic these days?

As far as we know, there are two reasons. One is that anamorphic provides a special experience to the viewer. If you enjoy an evening in the cinema it is much better to have the wide, broad view of a panorama picture which gives you a much more immersive experience. The other reason is that the anamorphic optical principles create special effects in the picture which many cinematographers like because of the special cine look given to their images.

Your ARRI/ZEISS Master Anamorphics are shipping now?

We started to deliver the first 10 sets before IBC and are continuing deliveries. Since the manufacturing process is very demanding it needs some time to get the production up to speed. Unfortunately some customers may have to wait for their lenses, but we promise that these lenses are absolutely worth the wait. As far as the schedule is concerned, we are on track with the complete set of seven: 35, 40, 50, 60, 75, 100, and 135 mm T1.9. and have plans for additional focal lengths.

As always, any comments and recommendations from customers are, of course, welcome.

Still Digital Times

STILL DIGITAL TIMES was hatched over fire and ice at Amsterdam Okura Hotel's superb Sazanka, the only Michelin-starred teppanyaki restaurant in Europe. It happened somewhere between the Moscato and the Malbec, punctuated by pyrotechnical sea bream and Wagyu beef. Winfried Scherle (ZEISS Consumer Optics EVP), Michael Schiehlen (ZEISS Director of Sales), and Egon Heldner (Shriro Managing Director), said, "Why not create a separate section specifically for still photography articles in Film and Digital Times?"

Why not indeed. Up to now, FDTimes has mixed still and motion together, somewhat the way Chef Chisa was stirring up the stir fried rice on the grill in front of us. Was the juxtaposition of, for example, Milvus next to Master lenses justified?

Certainly still photography has been an essential filmmaking ingredient for location scouting, production, promotion, casting, set design, grading, and personal use. Cinematographers are using still photography lenses on high speed, E-mount, mirrorless and DSLR cameras. An ever-increasing number of still photographers are shooting stills and video simultaneously, as we saw with the RED W8K in the ZEISS booth. ZEISS Milvus still lenses introduced at IBC have expanded focus scales enticing to cinematographers. We discussed hybrids, systems that excel in singular disciplines, and convergence or divergence.

I saw the divergent and contrasting light as Chef Chisa's workflow culminated in a blazing, brandy-fueled piscatorial display.

With thanks to Mssrs. Scherle, Schiehlen and Heldner for the advice, we launched a new section in Film and Digital Times. It's called STILL DIGITAL TIMES. Following are some appropriate articles from past editions.

Photokina 2014 - Cologne

Above: Palaces feature prominently in this edition. ZEISS invited their worldwide distributors to a 3-Michelin star dinner at Schloss Bensberg, near Cologne. The palace was built for Duke Johann Wilhelm II (below, left) for his wife Anna Maria Luisa de' Medici and completed in 1711.

Below, right: Photokina 2014 had 1,074 exhibitors, 5,961 journalists from 73 countries,125,336 visitors from Germany, 57,961 from other countries (mostly EU), 2,247 from North America; 66% were interested in cameras and lenses, and 19% in video.

"Portrait of Johann Wilhelm, Elector of the Palatinate" by Jan Frans van Doeven. c 1715. Bayerisches Nationalmuseum, Munich.

ZEISS Touit APS-C Lenses

Touit 2.8/12 E-mount

Touit 2.8/12 X-mount

Touit 1.8/32 E-mount

Touit 1.8/32 X-mount

Touit 2.8/50 X-mount

ZEISS Touit lenses for APS-C mirrorless interchangeable-lens cameras (MILC) from Sony and Fujifilm. The Sony E-mount has a flange focal depth of 18 mm. The Fujifilm X-mount has a depth of 17.7 mm.

ZEISS Touit lenses were introduced a little over a year ago—in June 2013. They combine compact size with outstanding optical and mechanical performance, and are fully compatibility with all Sony NEX and Fujifilm X camera functions (including auto-focus).The lens barrels are made of rugged metal, the manual focus barrel has a grippy, tactile ring, and iris has 9 blades.

ZEISS Loxia Full Frame Lenses

ZEISS Loxia 2/35 (35 mm f/2) and Loxia 2/50 (50 mm f/2) lenses took off at IBC and Photokina in the first flight of a new ZEISS family of manual focus lenses for E-mount full frame cameras.

These full-frame cameras are the 24x36mm Sony Mirrorless Digital Alphas: a7 (24.3 MP, ISO 100-to-25,600), a7R (36.4 MP without OPLF, ISO 100-to-25600) and a7S (12.2 MP, ISO 100-to-409,600, 4K video).

The new ZEISS Loxias are optimized for digital sensors and electronic viewfinders. They have mechanical apertures with stops that both click and can be de-clicked. Continuous iris settings will bring joy to everyone shooting video. Loxia lens apertures work in manual, automatic or aperture priority modes.

"Ever since the Sony Alpha 7/7r/7s helped compact system cameras break through to full frame, there has been a growing desire for a digital manual focus experience. The Loxia 2/35 and Loxia 2/50 are the first members of a new family of manual focus lenses for the E-mount full frame," said Christophe Casenave, Product Manager at ZEISS Camera Lenses.

The ZEISS Loxia 2/35 and ZEISS Loxia 2/50 lenses have an electronic EXIF lens data interface. When you begin to focus the lens, the camera can be set to instantly activate its viewfinder magnifier function.

The Loxia 2/35 optical design is based on a Biogon and has 9 lens elements in 6 groups. Minimum object distance is 0.3 m (11.8 in).

The Loxia 2/50 is based on a Planar and has 6 lens elements in 4 groups. MOD is 0.37 m (14.6 in).

The Loxia lens family intentionally avoids autofocus. This keeps them compact. They exhibit high resolution across the entire image field and beautiful bokehs.

ZEISS also paid particular attention to mechanical quality: the focus barrel's rotation of approximately 180 degrees is very smooth. Front filter diameter is M52 (52 mm filter thread) across the entire lens family. Lens barrels are made of metal and special weather sealing at the lens mounts prevent spray from entering between the camera and the lens.

The Loxia 2/50 will be available worldwide around October 2014 and the Loxia 2/35 around the end of the Q4 2014. Approximate, suggested retail prices: Loxia 2/35 around EUR 965.55 (US$ 1,299.00) and Loxia 2/50 around EUR 713.45 (US$ 949.00).

What do Loxia lenses mean for cinematographers?

Three things:

1. Yes, they will fit nicely on the new Sony E-mount Vérité camera. Even though the Sony FS7 is Super 35mm format, the 35 mm Loxia is still a 35 mm, and the 50 mm is still a 50.

2. What do ZEISS and Sony and a few others know that we don't? I think full frame still 24x36mm format lenses will become ever more prevalent for motion picture production.

3. The E-mount has a flange focal depth of 18 mm. This short distance enables lenses to be smaller. Therefore, in the future, it would be wise for cameras to have neutral mounts that can accommodate almost any lens mount via an interchangeable camera mount system (as originally proposed long ago by Alfred Piffl of P+S Technik).

ZEISS Loxia Full Format Lenses (cont'd)

Loxia 2/35 Specs

Focal length	35 mm
Aperture range	f/2 – f/22
Lens elements / Groups	9 / 6
Focusing range	0.3 m (11.81") – infinity
Free working distance	0.23 m (9.06")– infinity
Angular field of view*	63.02° / 54.06° / 37.57°
Diameter of image field	43 mm (1.69")
Coverage at MOD*	210.2 mm x 139.4 mm (8.28" x 5.49")
Image ratio (MOD)	1 : 5.8
Focus ring rotation	180°
Filter thread	M52 x 0.75
Diameter max.	62.1 mm (2.44")
Diameter of focusing ring	62.1 mm (2.44")
Length (without lens cap)	59.2 mm (2.33")
Length (with lens cap)	66 mm (2.6")
Weight	340 g (0.75 lbs)
Camera mount	E-mount

Loxia 2/50 Specs

Focal length	50 mm
Aperture range	f/2 – f/22
Lens elements / Groups	6 / 4
Focusing range	0.45 m (17.72") – infinity
Free working distance	0.37 m (14.57") – infinity
Angular field of view*	46,78° / 39,38° / 26,70°
Diameter of image field	43 mm (1.69")
Coverage at MOD*	255.1 mm x 168.3 mm
Image ratio (MOD)	1 : 6,9
Focus ring rotation	180 °
Filter thread	M52 x 0,75
Diameter max.	62.1 mm (2.44")
Diameter of focusing ring	62.1 mm (2.44")
Length (without lens cap)	59.2 mm (2.33")
Length (with lens cap)	66.2 mm (2.60")
Weight	320 g (0.71lbs)
Camera mount	E-mount

* Field of View and Coverage at MOD for 24 x 36 mm format

ZEISS Otus 55 mm f/1.4

Otus is a genus of owls with excellent nocturnal vision, and a new high-speed 55 mm f/1.4 lens from ZEISS. (The latest photo optics from ZEISS have avian appellations; Touit lenses are for APS-C format mirrorless cameras.)

The new ZEISS Otus 1.4/55 derives some of its optical design from Master Prime technology. With performance that approaches medium format optics, Otus offers improved image quality for full frame 35mm cameras.

The Otus 1.4/55 has superb sharpness, high image contrast and no visible chromatic aberrations, even wide open. This is the first lens in a new family of professional lenses from ZEISS, with additional focal lengths to follow.

The Otus 1.4/55 has high contrast all the way to the edges (even wide open) and consistent high-resolution performance across the entire image field. The lens has a completely new optical and mechanical design. The Otus 1.4/55 is equipped with floating elements—12 lens elements in 10 groups, including a double-sided aspheric lens and six lenses made of special glass with anomalous partial dispersion. These designs enable images without color fringing or distortion. Even cameras with lower density sensors will benefit from this lens.

The performance of the Otus 1.4/55 is especially impressive at night. Because the Otus 1.4/55 is an apochromatic lens, longitudinal chromatic aberrations (color fringes) are corrected. Color defects are significantly lowered. Bright/dark transitions in the image, and especially highlights, are rendered without artifacts. Although 55 mm is not a traditional focal length for architectural and landscape photography, this lens could be an exception. The edges of the image can be used at all apertures.

For portraits, the Otus 1.4/55 renders the finest details precisely. At f/1.4, you can use depth of field, and the Otus' smooth bokehs, to full advantage.

The mechanical design of the Otus 1.4/55 is also impressive. The smooth barrel movement, with a large angle of rotation, allows for fine focusing as well as follow focusing. The barrel is metal and tolerances are extremely fine. Focus scales are yellow, as they are on professional ZEISS cinema lenses. Recently, for its innovative product design, the Otus 1.4/55 won the iF product design award for 2013.

The Otus 1.4/55 is available with F bayonet (ZF.2) and EF bayonet (ZE). The suggested retail price is $3,990.

zeiss.com/photo

Why should cinematographers be reading this article? Although this lens has been designed for still photographers, the writing is on the...er...lens: f/1.14. It's a stellar performing, wide aperture lens that is the first of more to come. It covers full frame and Super35 mm will equal assiduity. Add a focus ring and you have might have the origins of a new cinematic species—owl allusions aside.

In fact, photographer/filmmaker August Bradley (below) has done just that: using the Otus 1.4/55 on his Sony F55 on recent productions. He showed his superb still photography with Otus at PhotoPlus Expo in New York last month. augustbradley.com

Technical specs

Focal length	55 mm
Aperture range	f/1.4 – f/16
Lens elements/groups	12/10
Focusing range	0.50 m (19.68") – infinity
Angular field**	(diag./horiz./vert.) 43.7° / 36.7° / 24.9°
Coverage at close range**	246 x 163 mm (9.69 x 6.42")
Image ratio	1:6.8
Filter thread	M77 x 0.75
Length with caps	ZF.2: 141 mm (4.93")
	ZE: 144 mm (5.01")
Diameter	92.4 mm (3.64")
Weight	ZF.2: 970 g (2.22 lbs)
	ZE: 1030 g (2.43 lbs)
Mounts	ZF.2 (F bayonet)
	ZE (EF bayonet)

** Based on 35mm full frame 24x36mm format

FILM AND DIGITAL TIMES

www.fdtimes.com

www.zeiss.com/camera-lenses