Optomechanix

The Marvel of Camera Design snd Engineering

Remembering Camera Designers

Olympus Camera Design

German Camera Design

Omid Museum

July-Sep 2018

Technical journal of OMiD, Opto-Mechanical Institute of Design

People behind the photo industry in 70’s, 80’s, and 90’s

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This issue Dedicated to:

Chester Carlson Chester Carlson (1868-1921) was an American inventor who developed the copy machine. In producing my book, I was amazed how a full color book with perfect bound cover could be produced today at a reasonable cost. This owes much of its credit to Chester Carlson who developed the copier machine from a basic idea. At first, his idea was rejected by photographic establishment, and no one saw the potential of it until a small company in east cost signed a deal to commercialize his product.

It was Harold Company in Rochester, which later became the Xerox corporation. The photo copier is not a camera, and it's not a printing press. It is something in between, and that's why no one saw its potential at the beginning. Ideas are worth many times more than diamonds, or gold excavation from mountains. Sometimes, they are being sought in the wrong mountain. When the right target is found, the product excels.

Left, Chester Carlson demonstrating his Xerox copier prototype still kept at a museum. Right, a commercially produced Xerox machine for the office.

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Optomechanix is a quarterly journal of Opto-Mechanical Institute of Design (OMiD), with technical articles for practical, hands-on opto-mechanical engineers. This magazine is privately founded.

Cover page photo: Leica Tri-Emar 35-50-70 for Leica M-Series rangefinder cameras
Inside page photo: Importers of cameras to US: Mamiya, Kpnica, Nikon, Inventor of flash, and magazine editors

The marvel of camera design, and engineering

This is a special issue that will go over the history of SLR. In past three months, I have been finishing up my second book about opto-mechanics inside cameras. My new book: "Restoring the SLR" describes the inner workings of many unique, and collectible SLR cameras. It's 300 pages with over 900 carefully drawn illustrations, and disassembly photos. The book is a culmination of almost 40 years of my research in opto-mechanics. These are a series of books about camera design, and engineering that no one has taken the time to produce: Opticians think it's the job of ME engineers to write it down. The mechanical engineers think it's all electronics now, and EE engineers think may be it's the job of CS majors because it's all computer programing! As a result, the engineering side of cameras is being lost with all its glory.

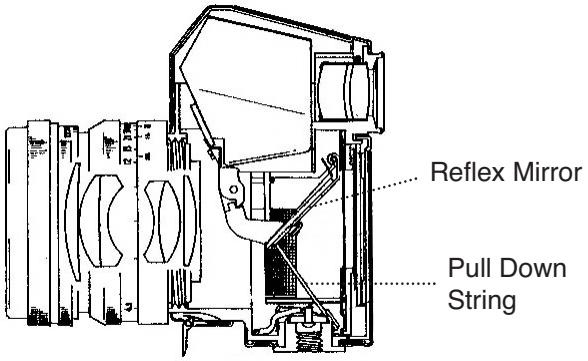
Kaoritsu Chatani, Blade-type focal plane shutter

The opposite has been true about watchmaking, where watchmakers played a role in preserving it. We don't even know who invented the blade-type focal plane shutter that's in every SLR produced today. His name was Kaoritsu Chatani (right), and you won't even find anything about him in the web. Did you know Charles Nobel? He went back to East Germany after WWII to continue producing his Praktica cameras but was arrested, and spent 10 years in Russian concentration camps. After he was released from prison, he produced Noblex cameras. Did you know Jeno Dulovits (right) was the inventor of the first eye level 35 mm camera called Duflex?

Jeno Dulovits, Duflex Camera

My two recent books: "Restoring the SLR", and "Leica Design 101", explain how cameras actually work, and this information can not be found in camera repair manuals. If you manage to find anything on vintage Leica, or any other camera, it would be some poorly drawn exploded views for parts. Camera design has tremendous value in opto-mechanical problem solving, and advancement. Many of the so called opto-mechanical designers that are highly paid in the defense

The optical path inside Bolex H16 camera reveals its prismatic design. The cinema industry had a reputation of being able to bend the light in various directions to get a clear erect image through the viewfinder. The larger format cameras had limitations to pack this design above the 35 mm full frame cameras. In 1941, Carl Zeiss invented the Penta-roof prism, and in 1949, right after the war, Contax S was introduced as the first 35 mm camera with a pentaprism.



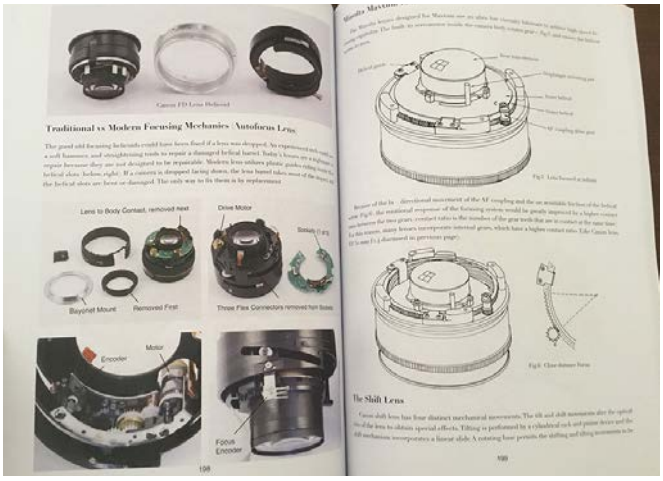
Above, Contax-S was the first 35 mm camera featuring a pentaprism design. I am sure you have seen reflex cameras before with its main mirror going up, and down during the shutter operation. In contax, the front edge of the mirror is pulled down by a tiny string (see Page 31), and it's simply let go before the exposure. This almost comic design started the most exciting journey in opto-mechanics history.

industry or other non-competitive markets, will come short in satisfying the consumer market. When a new idea pops up in designer's mind to create a new product, it's like a new novel that gets published. To produce authentic work takes an intuitive writer with the right ingredients so it would appeal to the masses. No one gets lucky in this business. Camera design requires the same magical ingredients. Designers of Canon F-1 guaranteed not to change it for 20 years, and they did. F1 was a masterpiece of opto-mechanical engineering, and it turned out a reliable workhorse among pro photographers.

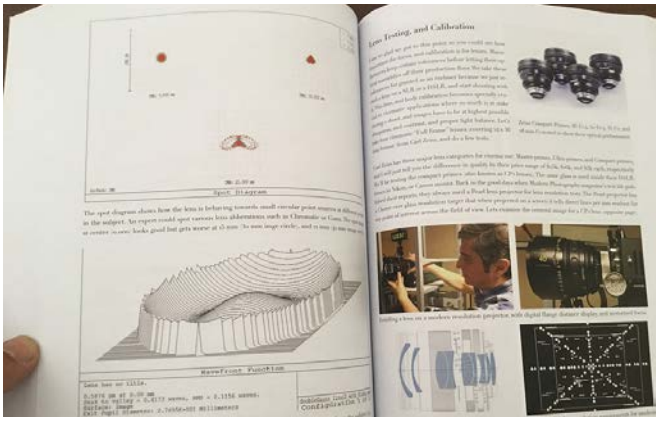
Maitani, The mastermind behind Olympus cameras

There is so much to learn from cameras, and yet everyone thinks just because it is laying around in museums, someone must have written about them. Watchmakers have been taking far more responsibility about their heritage, and have recorded their know-how in highly illustrated books. George Daniel's book on watchmaking is so detailed that you could learn to build a watch by just reading it, and following its step by step illustrations. He has a book about Berguet that describes his life, and his art in great detail. This is a typical devotion among watchmakers to share their entire knowledge of watchmaking they have patiently learned through a lifetime of apprenticeship. So the quartz watch didn't destroy the mechanical watch industry. It helped to strengthen it.

Restorign the SLR: Discussing the Robot camera, the Go-Pro camera of its time for the 35 mm film.



The new generation of lenses versus the very repairable lenses of the past. Above is a 50 mm f/1.4 Canon lens.



Lens testing is covered in the book utilizing a resolution target projector, and an autocollimator.

The Focaflex, and Wrayflex cameras with their unusual mirror, and viewfinder are discussed in detail.

My personal reason for writing this book is because I feel enormous sympathy for an industry that has lost its playing field. Camera design has been an exciting journey for those who have been following it through the years. We had a whole industry with many ingenious minds in design, and problem solving that's basically banished with the emergence of digital age. There is only a short lived window that we could document the classical era that just walked passed us. So soon, most of the people involved in this industry will be gone, and no one would know much about who they were. Manufacturers don't really have time to write it down. You can't even find a photo of Zenzaboru Yoshino, the creator of Bronica in the web. Most of the classical photographic journals are gone. Bob Shell, who used to be the chief editor of Shutterbug magazine tells me the same thing: This era is being forgotten, and most of these people he recalls that built this industry, you could hardly find much information about them in the web.

The thing I have learned about the web is the digital age's promise that we'll save it all for you in Godzilla bytes of memory space is not really true. While searching some of the important names for my book, I realized most of what used to exist in the web no longer comes up in search engines, and that makes a lot of sense: The information is buried under what some people pay to be pushed higher in search engines. The search engines work with an algorithm that can be manipulated by agencies whose only job is to make their clients' name show up on top. Chances are, so many significant people would simply banish below this digital stack. I think life is a culmination of all the experiences that only you, yourself could collect and make it meaningful. Otherwise, unless you are Elvis, all your personal belongings, and life photos will be tossed away when you are gone. If you care about something, write it down, and publish it somewhere like Wikipedia so hopefully, someone would look after it.

"Opto-mechanics", or "Opto-electronics" in cameras stands for so much more than it seems: It stands for design with mechanics of motion, vibration, linkages, gears, ball bearings, lubrication, piezoelectric motors, electromagnetics, motion control, shutter break system, metallic coating on plastics, composite materials, micro-mechanics, temperature compensation, optical alignment, optical design, binary optics, diffraction optics, prism design, optical coatings, Charged Coupled Devices, CMOS technology, micro lens arrays, autofocusing, photo-electric effect, visible and infrared sensing, Integrated Circuits, GPS, microprocessor based design, pattern recognition, auto focus technology, computer programming, analog circuit design, tele-communications, touch screen LCD, and computer user interface, etc. You have all this in a dark box called the camera. I can't think of any other industry that employed all these technologies in global competition except the historical moon landing mission.

Ali Afshari

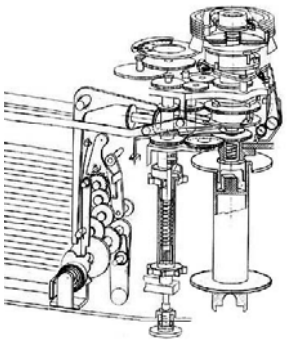
Reastoring the SLR is available for sale from amazon.com
ISBN: 978-1-5136-4044-0, Copyright 2018

Remembering Camera Designers

1.Duflex: The first camera with eyelevel viewing, made in Budapest in 1947 by inventor Jeno Dulovits. The camera was the first to have instant return mirror, bayonet lens mount, auto diaphragm closure before the exposure.

2. Sport: The first 35 mm SLR made in Russia in 1934, a year before Kine Exakta (designer unknown). It featured a reflex mirror that swinged up, and a focal plane shutter that utilized single blades for the first, and second curtains.

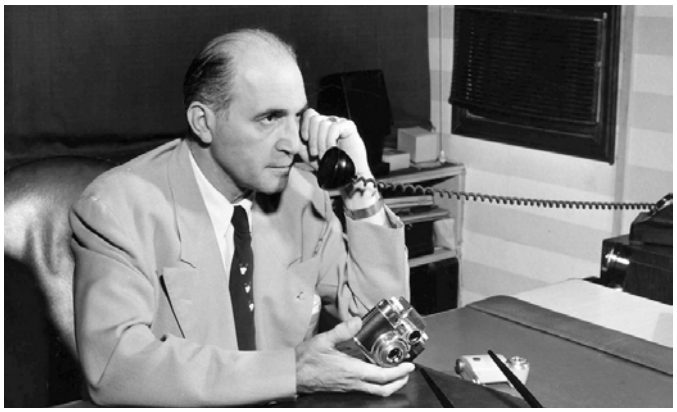
3. Kine Exakta from Dresden: The first commecially successful SLR, designed by Johan Steenbergen from Netherlands (left), and Karl Nuchterlein (R). The camera featured a bayonet mount, focal plane shutter, lever advance film transport.



Heinz Kuppenbender Designer

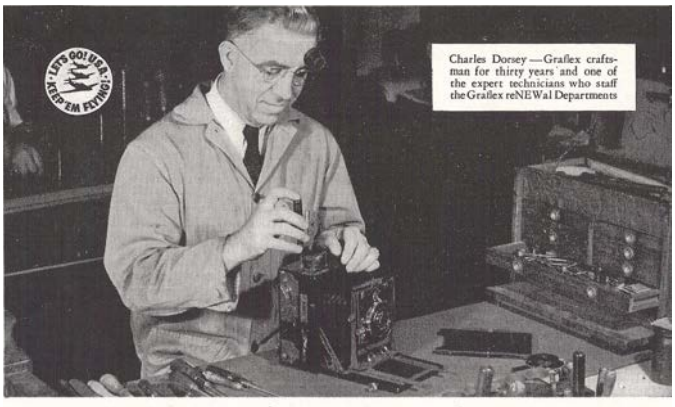
4. Contax IIa from Dresden, Germany: The first metal constructed segmented shutter that worked like a roll-up door, and was actually released like a door lock by a latch at its center. It featured non spinning shutter speed dial.

5. Contax-S: The first SLR with Pentaprism by Wilhelm Winzenburg (R). The patent for this camera was filed on 1942, but WWII nearly destroyed Carl Zeiss factory in Dresden, and it wasn't until 1948 that this camera was actually made.

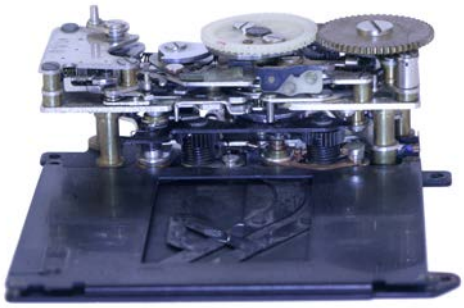


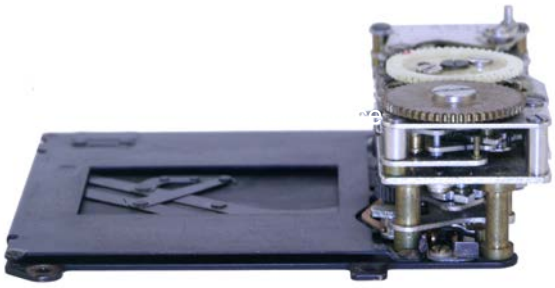
6. Alpa camera camera were designed by Ukranian born Jaques Bolsky (Bogopolsky) in 1938. The 16 mm Bolex was also his design whose optical layout is diplayed in the introduction. Alpa became world famous Swiss made camera.

8. K-20 Aerial camera designed by Sherman Fairchild. He had numerous patents in this field to ensure film flatness across the film plane during exposure by an air suction mechanism from behind the film pressure plate.

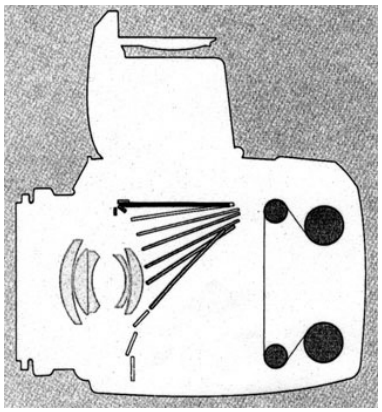


10. Graflex camera was the camera of choice for many photagraphers from early 19th century to 1973. Its original patent was filed in 1904, designed by William F. Folmer company was later by Kodak. Charles Dorsey (R) was the lead tech.





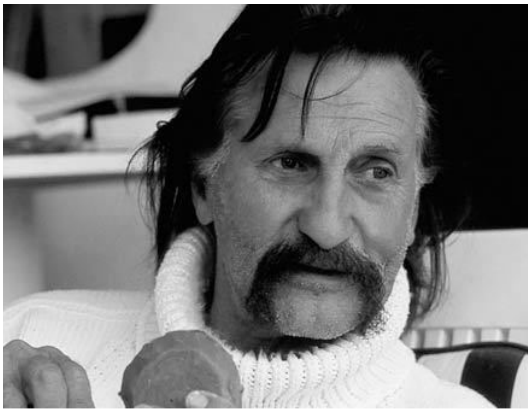
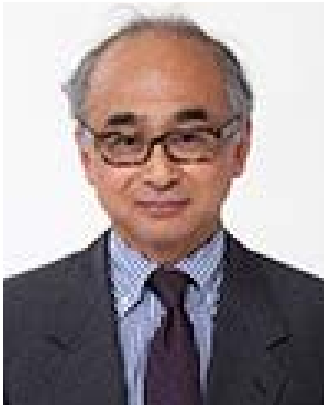
11. Metal blade focal plane shutter ws invented by Kaortitsu hatani in 1930's. It allowed manufacturers for the first time to purchase shutters from Copal or Seiko. It is the focal plane shutter of choice, utilized in all SLR cameras made today.



Bronica medium format camera by Zenzaburo Bronica. Bronica had an obsession with deep penetration of optics into his SLR cameras. His designs swinged the mirror to the bottom or in segments (above) to avoid its collion with the lens.

Praktica was designed by Seigfried Bohn (middle). John Nobel (right) with his son Charls who owned the company, went back to E. Germany after WWII to take over their factory but were arrested, and spent 10 years in concentration camps.

Beaulieu camera's interchangeable lenses produced by Pierre Angenieux (right). Today, Angerieux is a world reknown optical lens manufacturer based in France. Angenieux also manufactured lenses for still cameras such as Rectaflex.

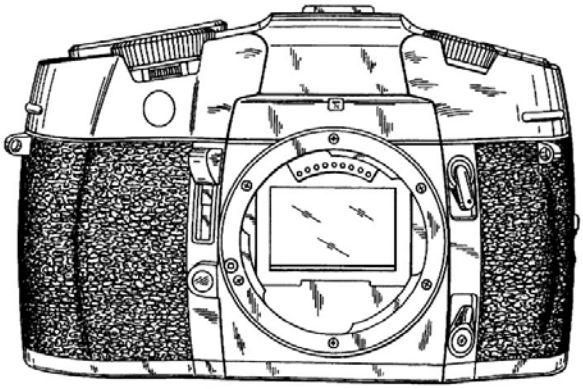



14. Prior to release of Canon T90 in 1986, Lugio Golani, a German industrial designer was hired to cooperate with Canon design group lead by Yoshiaki Sugiyama (R) to develope the new body design, later to become the EOS system.



Hasselblad designed by Sixten Sason (right). Victor Hasselblad (introducing his camera, center) gave his employees a year's salary to develope the new camera. The 1600F was released, later 1000F, indicative of their top shutter speeds.


16. The design of the first digital Camera is credited to Steven Sasson, and engineer at Eastman Kodak in 1975. The camera used a Charged Coupled Sensor (CCD) that recorded images on a magnetic tape.




17. Leica M8 was the work of Manfred Meinzer (right), and Alfred Hengst. The design was influenced by earlier Canon EOS design patents, and Requla Reflex designed in by a forgotten Italian designer.

Mamiya Siichi was an inventor and designer and with the financial back up of Tsunejiro Sugawara, they founded Mamiya Optical Works in 1940 in Tokyo. Ten years later, they expanded to make their own optics, and leaf shutters.

18. Minolta was founded by Kazano Tashima in 1966 in Osaka, Japan. The company was in competition with Canon, and they both introduced similar camera to the market. SRT101 (left) competed with Canon FTb to same customers.

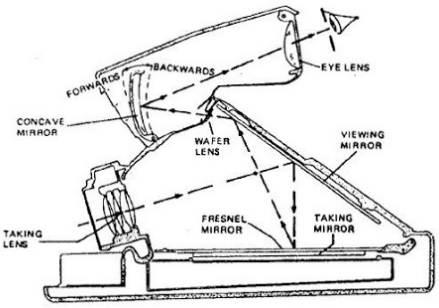
19. Minox Camera was designed by Walter Zap in Wetzlar Germany. The camera's shutter design, is different from many other shutters. Minox is engineered like a wrist watch and specially the shutter has extremely delicate parts.

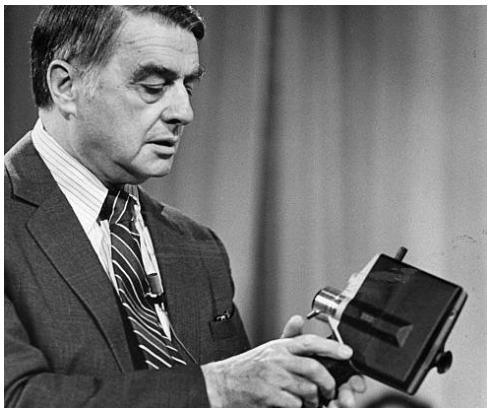
20. Nikon F body was designed by Architect Yasaku Kamekura (right), and Nikon design team lead by Masahiko Fuketa in 1959 (center). It influenced SLR design towards a radical design change, and Nikon appealed to pro photographers..

23. Olympus OM-1 design was the work of Mr. Maitani, also behind previously designed Pen- FT, and Olumpus Pen. Maitani's team learned how they could place the components inside the camera to acieve a super ompact design.

Pentax was founded by Kumo Kajiwara (right) in Tishima near Tokyo in 1923. Sauburo Matsumoto (left) was the designer of the Asahiflex, the first camera with instant return mirror. Pentax made cameras from small Auto 110 format up to 6x7

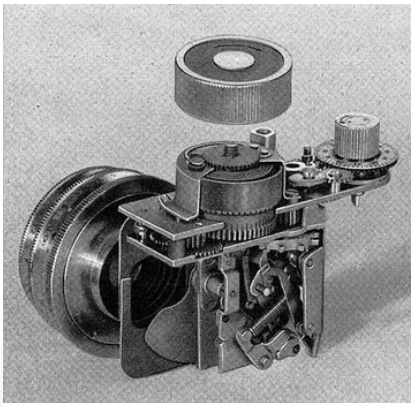
Periflex was designed by Kenneth Corfield, a well known Britsh camera designer. Him, and his brother manufactured 35 mm cameras between 1950-1961. The camera featured a small mirror that flipped down behind the lens for focusing.





Polaroid SX-70 was designed by Dr. Edwin Herbert Land. He had several patents for Polaroid process, and its film cartridge. His first camera went on sale in 1948, allowing instant pictures be developed in 60 seconds.

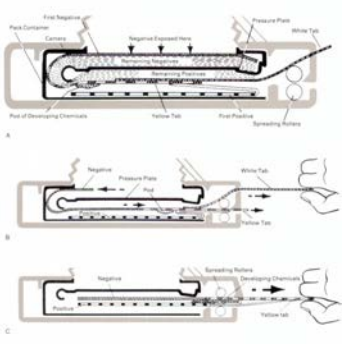
24. Rectaflex was designed by Telemaco Corsi (right) in 1948 in Milan, Italy. It featured a pentaprism. The original pentaprism was patented by Zeiss in 1942, but during WWII, Zeiss facility was destroyed, and Rectaflex became the first.



26. Robot was designed by Hans Heinrich Berning in Wetzal Germany. It was the Go-Pro of the 1940's. It utilized a disc shutter. The camera was cocked first, and could be fired in rapid sequence as fast as 2 frames per second.

27. Yashica was founded by Yoshimasa Ushiyama in 1953, and became Japan's leading manufacturer of cameras. Later, their collaboration with Carl Zeiss to produce Contax RTS, created one of the most advnced cameras of its day.

28. Contax RTS was designed by Fredrik Porsche group. It was a collaboration between Zeiss, and Yashica. The design of Contax brought new possibilities into camera design such as a very linear focal plane shutter.



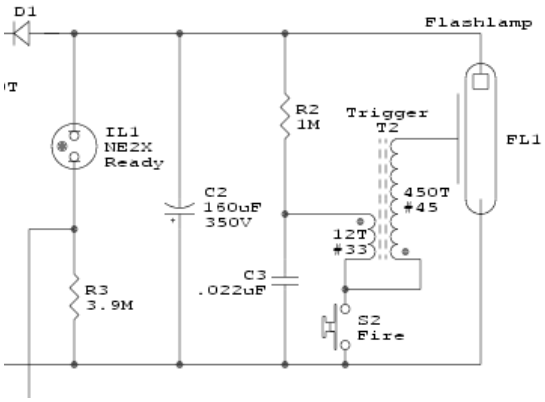
The Original Polaroid Concept

Polaroid Land camera designed by Walter Teaque, the American architect, and industrial designer who also designed the UPS truck, and Airefoce-one. The original polaroid required a tab being pulled out of the camera by hand (center).

Fred Spira, importer of Japanese cameras, and lenses to US under his brand Spiratone. At the time, in photographic magazines, Spiratone lenses were famous for having very low prices, such as a 400 mm lens for SLR for $64!

Canon AE-1, the world's most affordable auto-exposure 35 mm camera was introduced in 1976. Canon's new management (Fujio Mitarai, center) cut costs, and focused on profits to make Canon one of the most successful cameras.

Kodak Retina cameras were manufactured in Wetzlar, Germny for Kodak. George Eastman (right), the manufacturer of inexpensive roll film under brand name Kodak, became the largest photo supplier world wide.

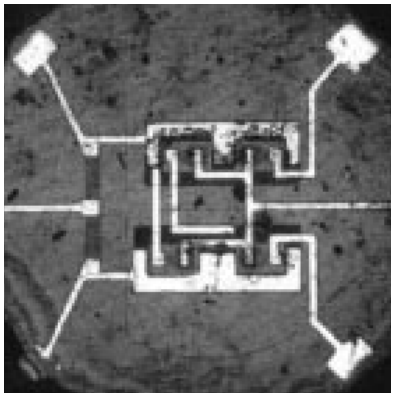


Harold Eugene Eddington, inventor of electronic flash, was a proffessor at MIT. His high speed bullet photpieo rcing through an apple made to Life magazine. He also managed to take exremely short photo of an atomic explosion.

Bolex 16 mm camera was designed by Jacques Bolsky. The reflex camera was intended to bring home movies to every household, and it proved to be very successful. Bolex became a world reknown manufacture of cine equipment.

Zeiss lenses for Contax were designed by designer Dr. Erhard Glatzel (R). He designed Contax RTS lenses, while Dr. Katsuiko Sugaya (no photos found) designed the unique Contax RTS shtter (left) with balanced curtain acceleration.

Manfroto Tripods designed by Lino Manfroto right), an Italian photographer who began making tripods for his own use but they became popular amoung photographers that he changed his job. His distributor in US was Lester Bogen (L).

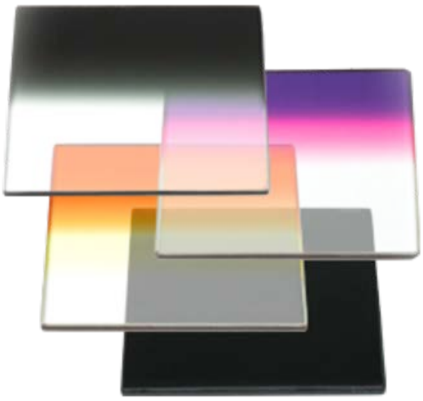


Fairchild Semiconductor by Sherman Fairchild (right). Shockley had invented the transistor using Germanium, but four of his lead men quit, and started Fairchild semi conductor, making transistors with Sillicon (pioneers of Sillicon Valley).

Konica camera was Imported by Henry Froehlich, who promoted sales of post war Japanes cameras in US beleiving in their high quality. He had designed his own rangefinder for Koni Omega camera, and held a patent on the design.

Mamyia Imported by Paul Klingenstein for the professional photo market. Mamyia RB-67 (L) was a 6x7 cm studio camera while the smaller medium format camera, Mamiya 645 (R) was a more portable camera. Both cameras used 120 film.

Nikon was imported by Joe Ehrenreich (right). His company, Ehrenreich Phot Optical Imports (EPOI) also distributed Rollei, and Bronica, all professional grade cameras of the film era.



Tiffen Filters, invented by Ira Tiffen (right), a master optician who could mix glass to make any type of filter for photography. Left, Tiffen 4“ x 4” glass filters for cinematic use. Tiffen’s neutral density filters are made with absolute neutrality.

Nikon F3, designed by Georgetto Guigiaro. This was an era where camera manufacturers were starting to bring in Architectural and industiral designers to improve the looks of their cameras. He added the red line on Nikon handgrips.

Arriflex cameras manuals by Jon Fauer. He is the passionate film making guru with books on Arriflex that became standard user manuals for every camera man. Jon Faur is the publisher of Film and Digital times covering cinema optics.

Jack Naylor had the world’s largest private camera museum. His museum is like a basement mase, still open to public with thousands of cameras, and books in Boston, MA. He befriended Dr. Edwin Land, and Harold Edgerton of MIT .

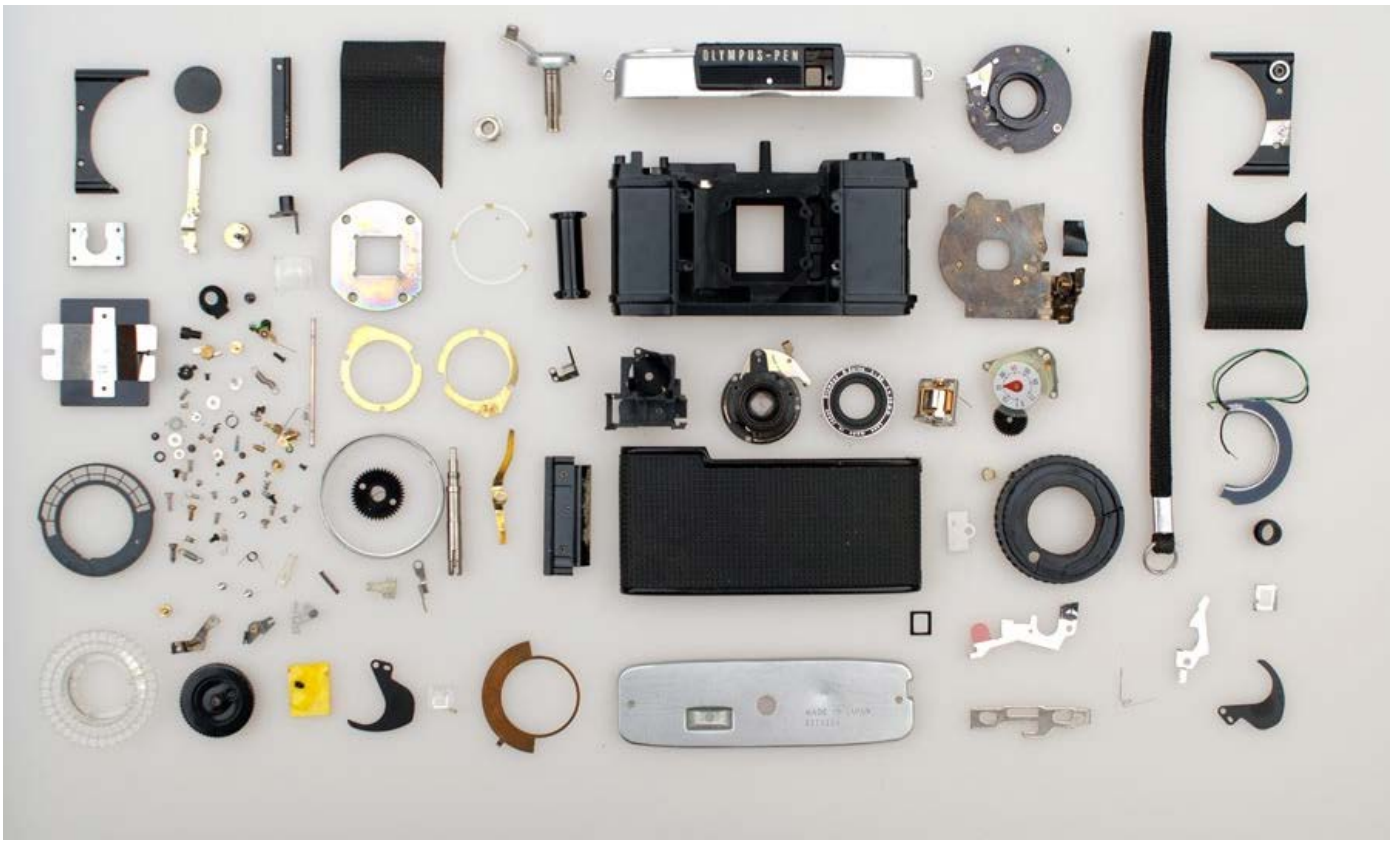
The story of Olympus Pen Design

I would like to dedicate this section to Mr. Maitani, whom I have a lot of respect for as a visionary Camera designer. For this reason, before covering Pen F, I will discuss one of his first camera designs, the Olympus Pen.

Yoshihisa Maitani was born in 1933. Since boyhood, he felt an affinity toward cameras and photography. After studying mechanical engineering at university, he joined Olympus Optical Co., Ltd. (now Olympus Corporation) in 1956. As a camera designer, he was involved in the development of many cameras that triggered major booms and became milestones in world camera history, including the Olympus Pen (1959), the Olympus Pen F (1963), the Olympus OM-1 (1973) and the Olympus XA (1979). He dies at the age of 76. In his own words, He recalls his design process of Pen in his starting career at Olympus:

"In those days, almost all camera buyers were men: Men accounted for about 98% of the market, and women around 2%. Men like machines. They dream of Harley-Davidsons. That's why we made cameras with so many controls. The accepted wisdom was that real cameras had to have lots of controls.

However, a month after Olympus launched the Pen, I happened to see a mother photographing her little boy while I was on my way to work. She was using a Pen. I was so excited to see someone using the camera that I'd designed. But



after I watched her for a few seconds I started to worry. I wanted to warn her that the picture would be out of focus with those settings.

It was then that I decided to design a camera that a woman like that would use. There would be no difficult controls. It would be so simple that the user would just have to push a single button. Yet this concept was the exact opposite of the cameras that were selling well on the market. The sales staff told me that it wouldn't be a proper camera, and I later heard that a conference of branch managers had also concluded that my design would not be a real camera. The head of the sales division came to see me in person and tried to persuade me to abandon the idea. I'd only been with Olympus for about three years, and it was only a year since I'd returned to the design department after my training in the factory. I was just a youngster. And yet this executive came to see me. He sat down with me and begged me to give up my idea. I impudently countered each of his arguments, and we continued to argue from morning until the end of the day. However, a junior employee cannot expect to win an argument with a division chief.

I realized that the barrier of accepted wisdom was about to prevent my idea from becoming reality, so I asked him to wait until the next day, when the prototype would be ready. I worked all through that night, and the next day I showed him the camera. He played with it in silence for about 30 minutes. Finally he looked at me and said, "Maitani, let's do it!" As the proverb says, a wise man will change his opinion, a fool never. I was filled with admiration, and wondered if I would have been able to change my mind like that if our roles had been reversed. It's not easy. And so we decided to manufacture the new camera.

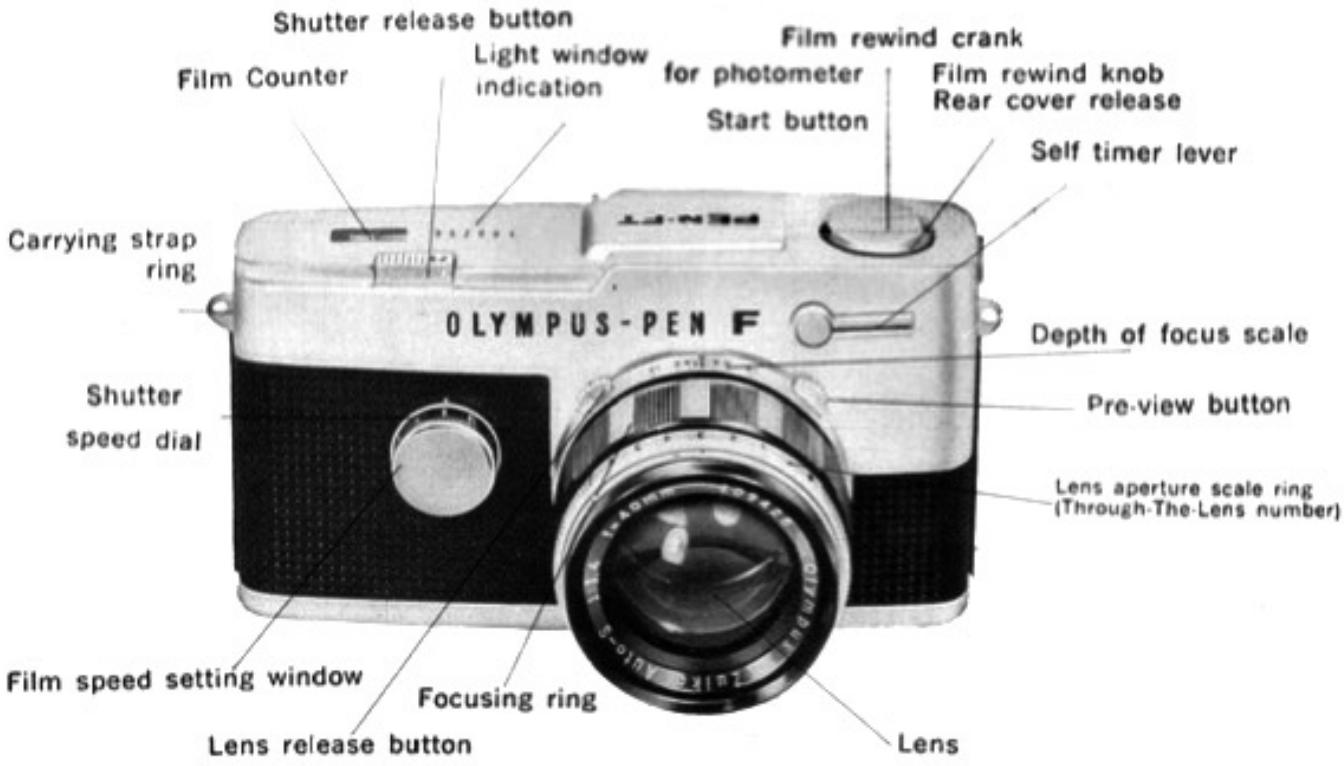
At the final planning session, I proposed a price of 8,000 yen. The sales people said that the price should be 10,000 yen. I had been involved in the design of many cameras, but never before had the sales people wanted to set the price higher than the figure suggested by the developers. That rarely happens. Ultimately the new camera went on sale at 10,000 yen, and it became a huge best-seller. The Pen was a major hit with women and 17 million were sold."

The story of Olympus Pen-F Design

In 1959, Olympus released a new concept in SLR design called Pen-F. It was a half frame camera that revolutionized camera design in many ways. The opto-mechanics design of Pen-F resembled motion picture cameras of the time, where the mirror actually swinged left instead of up, and the image erecting system utilized several prisms not found in standard 35 mm SLRs. The Pen-F used for the first time, a Titanium disc shutter that hid behind the fiewinder optics in such a way that it was impossible to tell from outside of the camera. An earlier design that had utilized this shutter was the American made Univex Mercury of 1938. In Mercury, the disc shutter housing extruded out from the top of the camera. The design, and fabrication of Pen-F shutter proved to be a difficult task for the Olympus design team. A super thin 0.0016 mm Titanium shutter blade was needed to make the shutter reach the 1/500 Sec. speed.

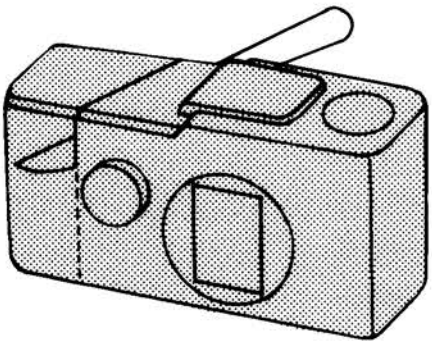
Here is the story in Maitani's own words: "We concluded that the only way to increase the speed of the shutter was to reduce the weight. Apertures and shutters are made of thin steel sheet. The steel is about six hundredths of a millimeter thick, which makes it too heavy to rotate any faster, so we tried using aluminum, which is lighter than steel. We found that the connection between the shaft and the vanes was not durable enough, so we increased the number of fasteners. Once we had securely fastened the vanes at one end, they started to break at the other end. The shutter would rotate, but the sudden force ap-

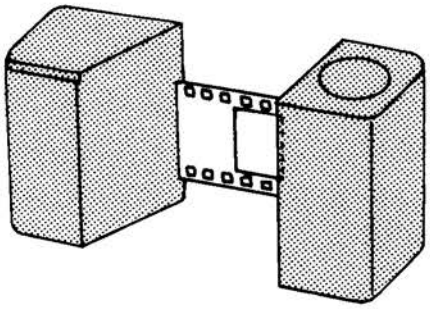
Univex Mercury 1938

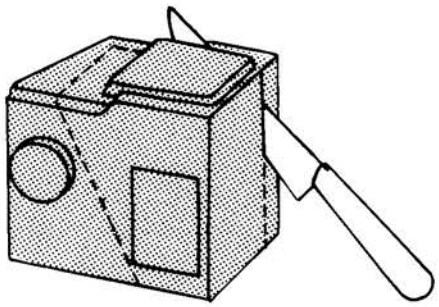


plied when it stopped caused a massive shock. The aluminum sheet crumpled like a fan. This was hopeless, so we decided to look for other light materials. The next substance that we tried was titanium, which was being used by NASA. Titanium was very rare at that time, and the purchasing department desperately searched for a source. Eventually they found a supplier somewhere in Yokosuka. We only needed a minute quantity for our prototype, but the supplier refused to sell the titanium piecemeal, and so we were forced to buy an entire roll. It was extremely expensive, but fortunately we were able to use it later, otherwise we would have incurred a huge loss.

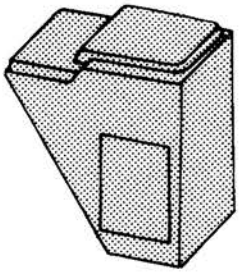
By using titanium, we were able to increase the speed to one three-hundredth of a second. But it still wasn't fast enough, so we made the titanium even thin-

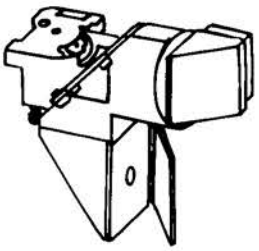




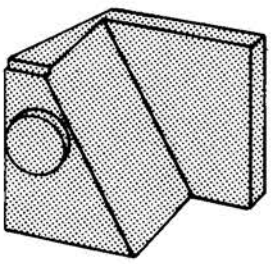


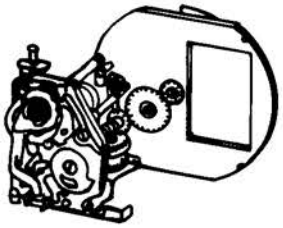
Cutting the Olympus Pen-F cheese: Maitani's mind set in all his designs was to keep changing the layout in his mind until he was able to fit things together like a puzzle.



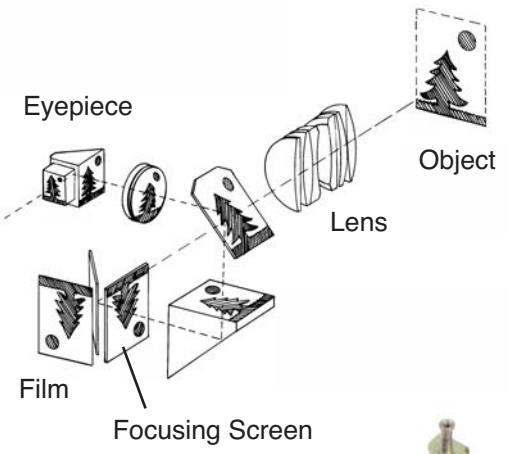


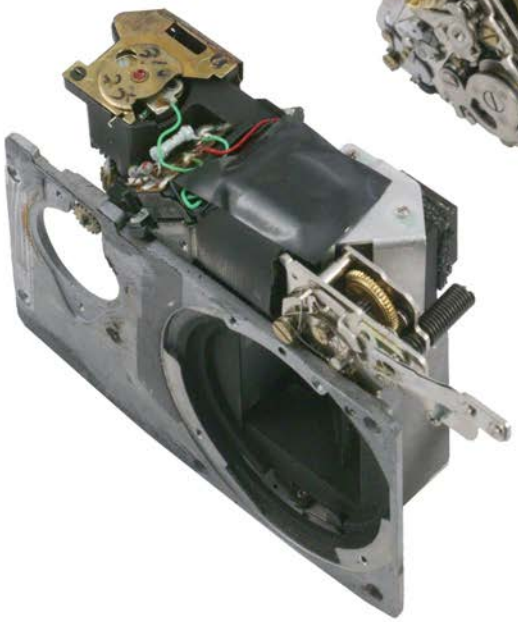
The viewfinder in Olympus Pen-F is designed to fill the empty space inside the camera formed by its disc shutter.



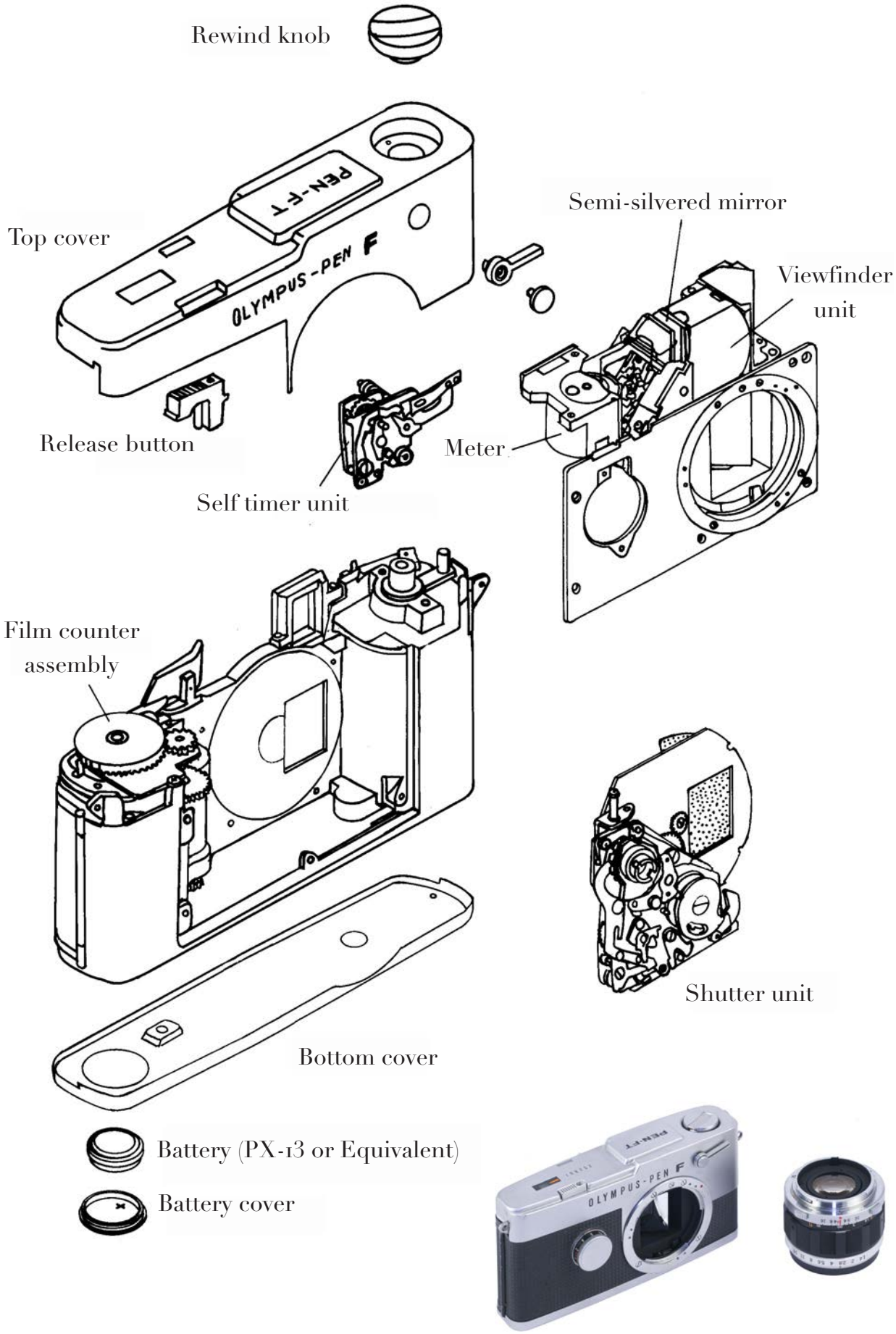


The disc shutter in Pen-F occupies the empty space inside the camera formed by the shape of its viewfinder.

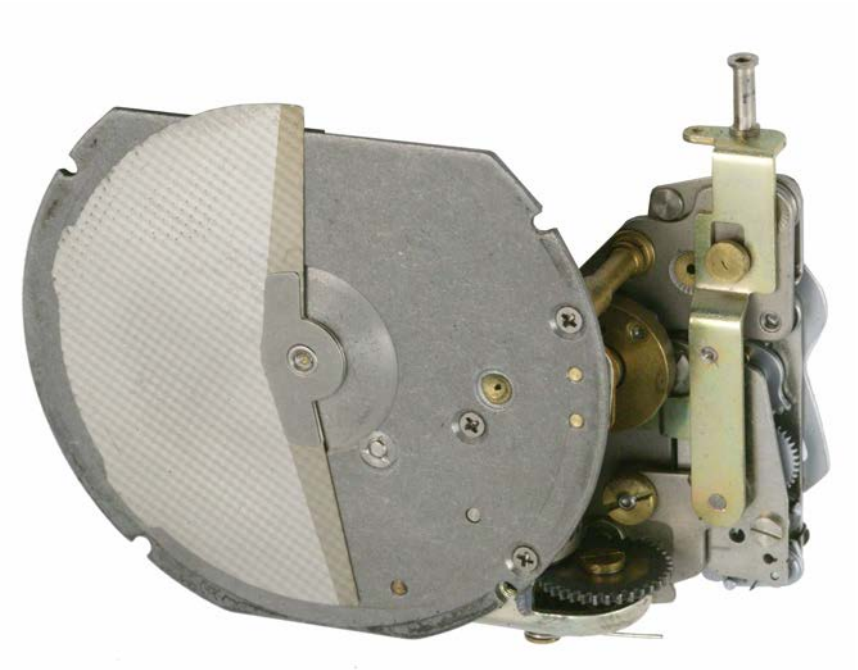


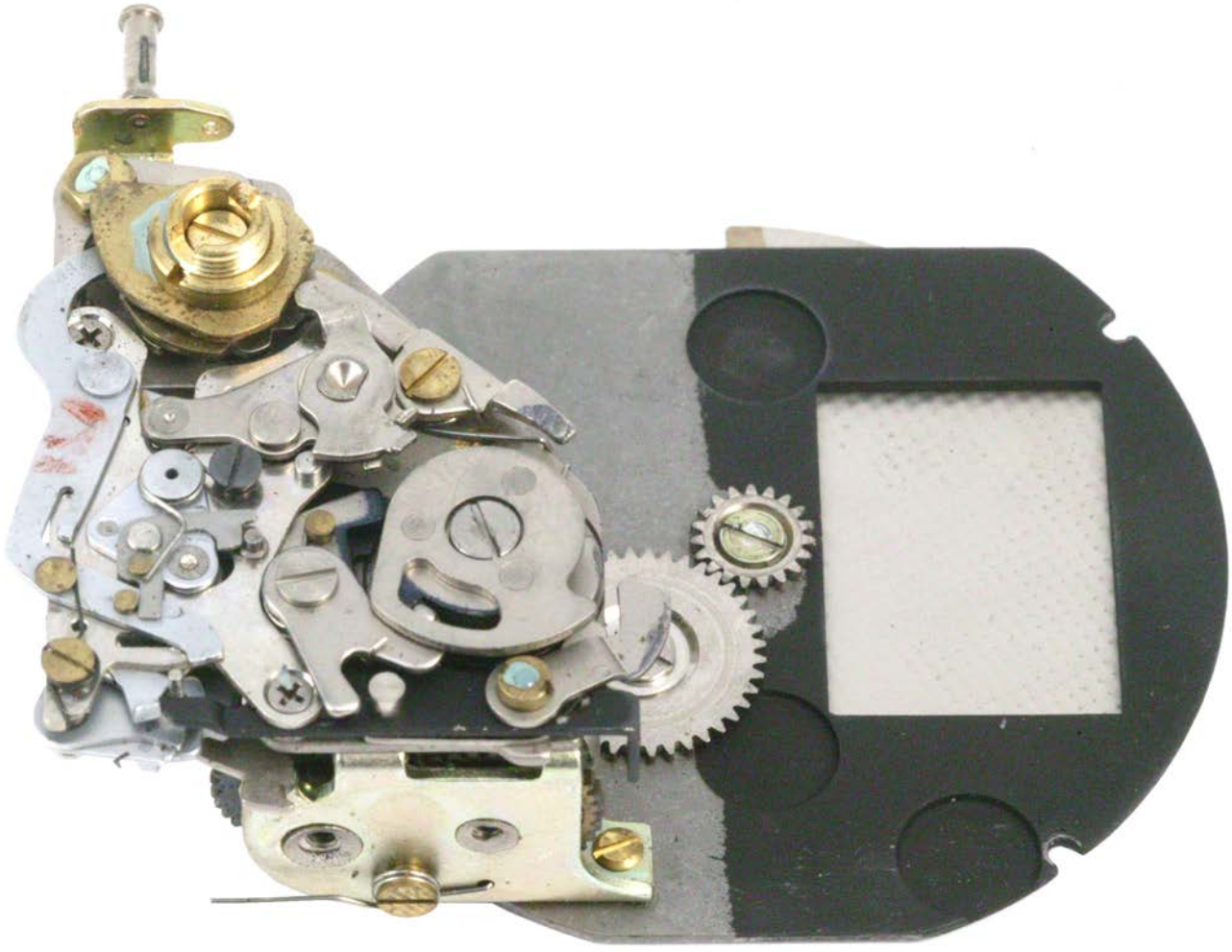


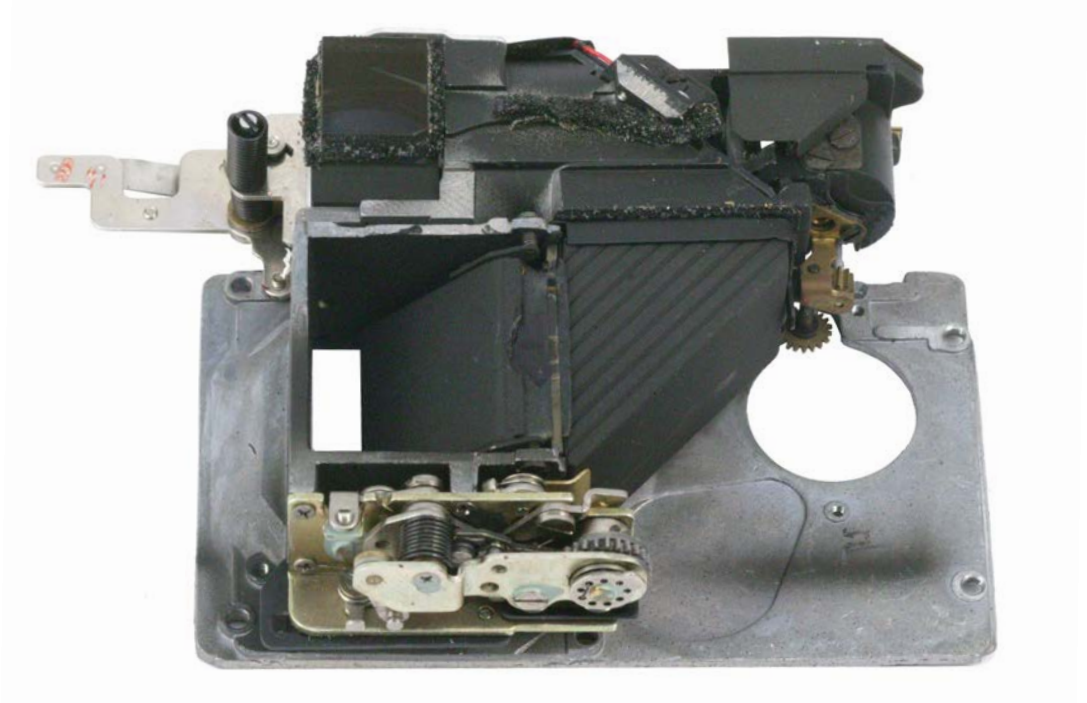
The light path in Pen-F (upper left), shows how the prism arrangement erects the image before it reaches the eye. This arrangement is unique to this half-frame camera because in full frame 35 mm still cameras (24 x 36 mm), there is simply no room for so many reflections. In motion picture cameras like Arriflex, and Bolex, there is room for this arrangement because their format is relatively small.


Rewind knob
Top cover
Semi-silvered mirror
Viewfinder unit
Release button
Meter
Self timer unit
Film counter assembly
Shutter unit
Bottom cover
Battery (PX-13 or Equivalent)
Battery cover

ner, but it crumpled like a fan. Then we remembered a technology used in microscope manufacturing, whereby the glass is etched away in the center leaving it thick at the circumference. When we etched the titanium in the same way, we were able to increase the speed almost to one five-hundredth of a second. But even this was not fast enough. The only solution now was to strengthen the spring. That enabled us to achieve a speed of one five-hundredth of a second initially, but the spring would break after a few repetitions. When we examined the affected parts under

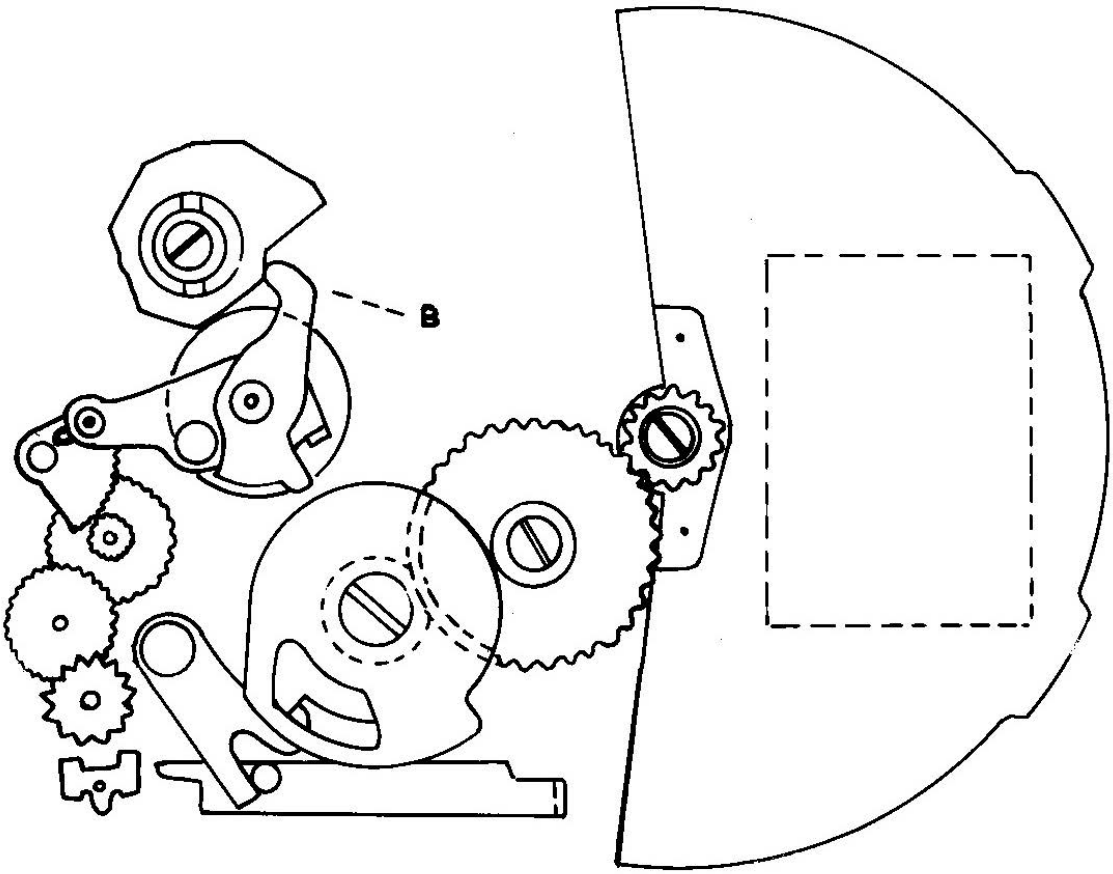






a microscope, we saw that even though the spring was made of ordinary steel, it looked like a rough piece of rope that had been pulled apart. It was metal fatigue.

Eventually we solved the problem by using a special spring made of Swedish steel. We had reached the 500 mark, but we still had to find a way to accommodate slower speeds. Today we can do this with computers,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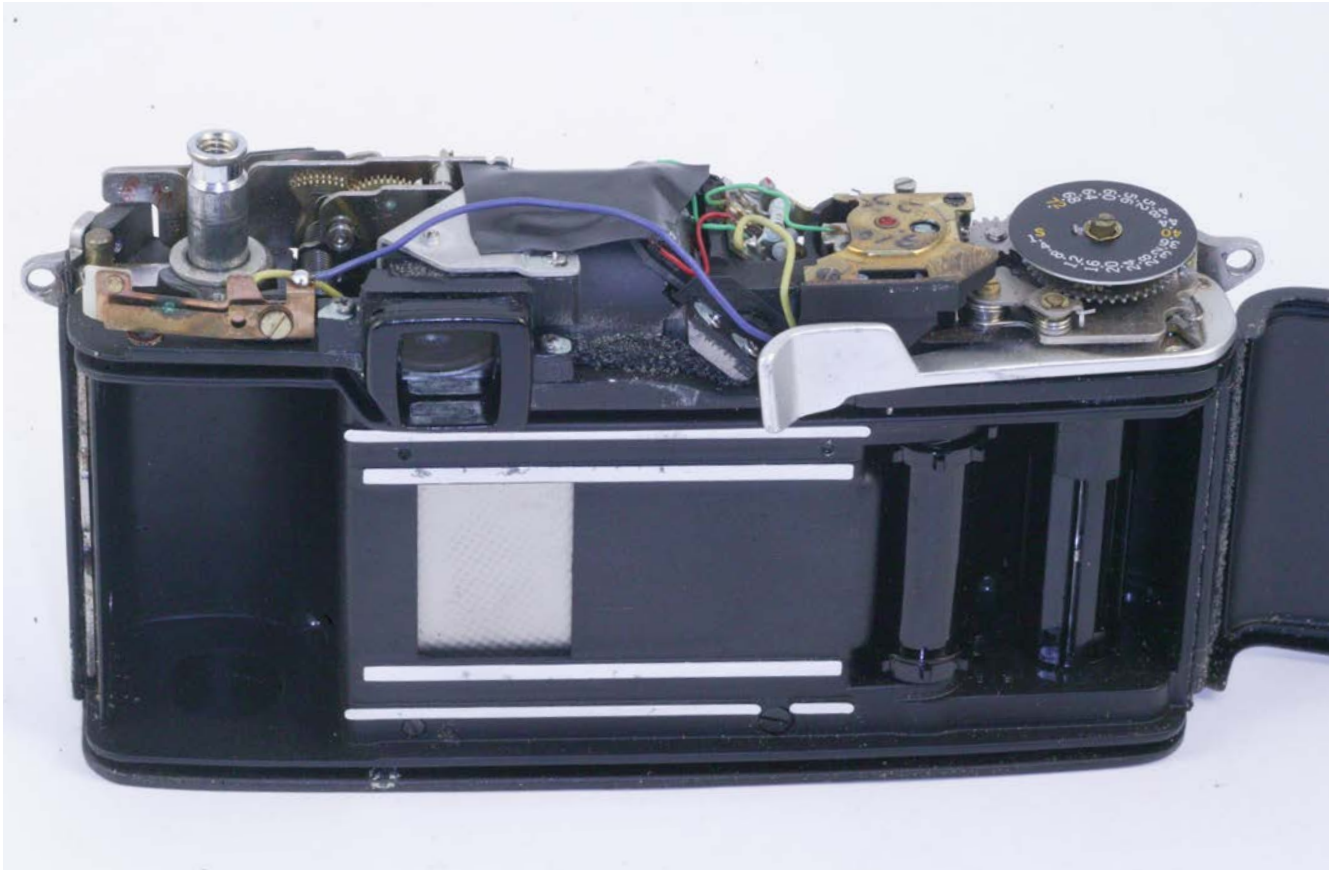
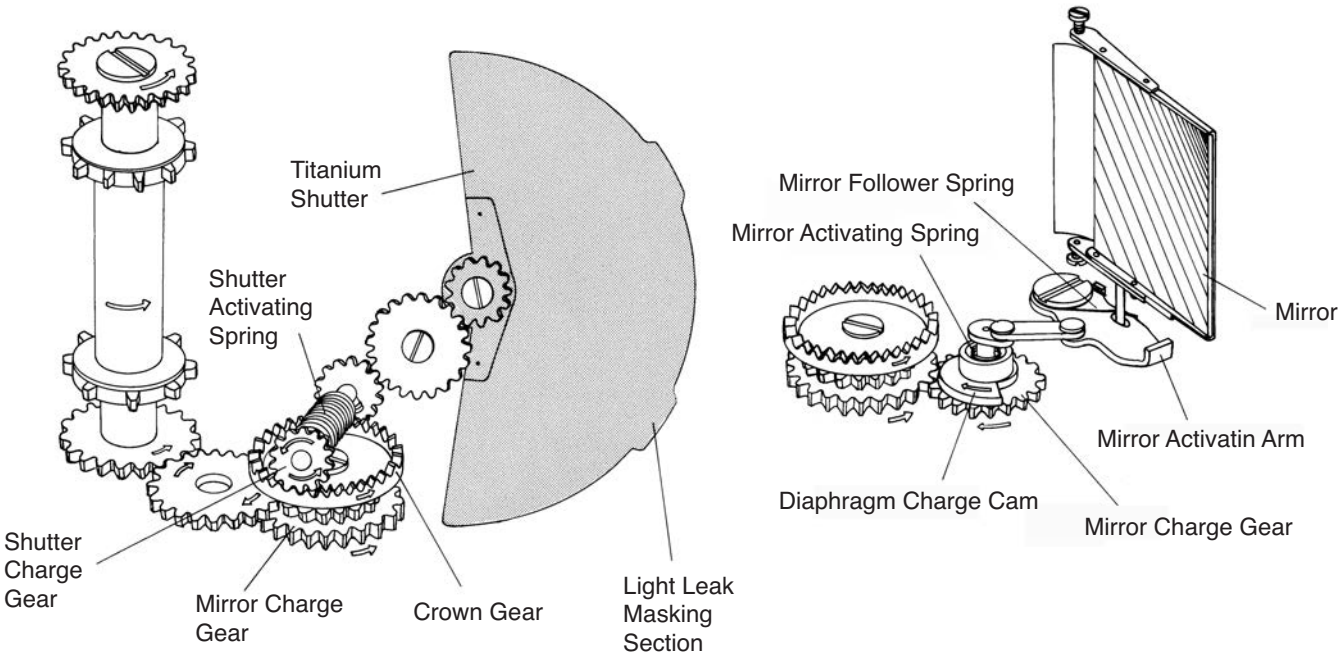


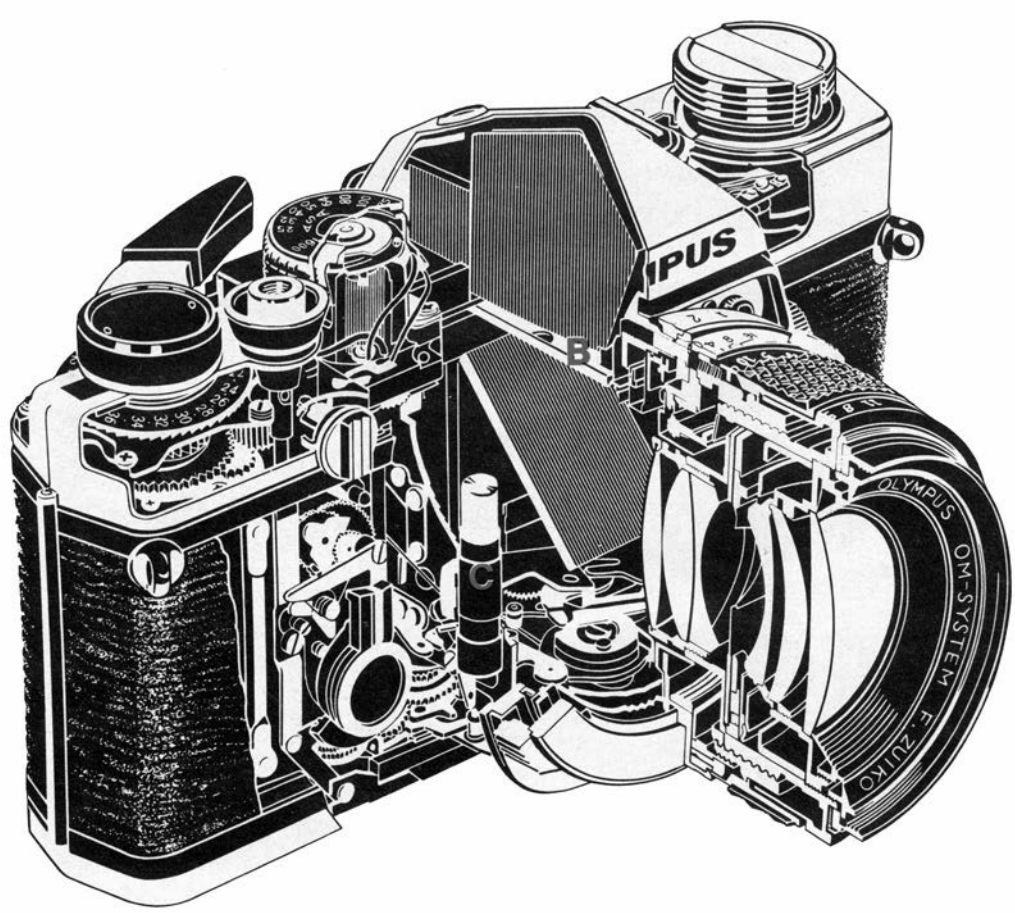
but back then we had to use mechanical gears. The shutter membrane must be held in the fully open position, which puts the gears under a tremendous strain. They told me that the mechanism just stopped. In fact the gears had been totally stripped; half the teeth had been broken off. We overcame each of these problems in turn, and eventually we were somehow able to build our focal plane shutter." From a seminar presented at the JCII Camera Museum on Saturday, October 29, 2005



Olympus OM-1, Maitani's next design

I covered two cameras by Olympus, but it won't be complete if I don't cover their most famous model, the OM-1. Again, here is Maitani's own memories when designing this camera:

"To create products that will capture the hearts and minds of users, you first need to break through the technology barrier. When I designed the Pen, I worked alone. Now I had a staff of about 100. But 100 people giving 100 percent will not result in a hit product. To create technology that will spawn hit products, you need people who will give 120 percent. The designers said that they wanted more specific figures, so I told them that the camera wouldn't feel smaller unless the size was



Radical Design Change:

Diaphragm Control Ring

Shutter Speed Dial behind the lens

Interchangeable Focusing Screen

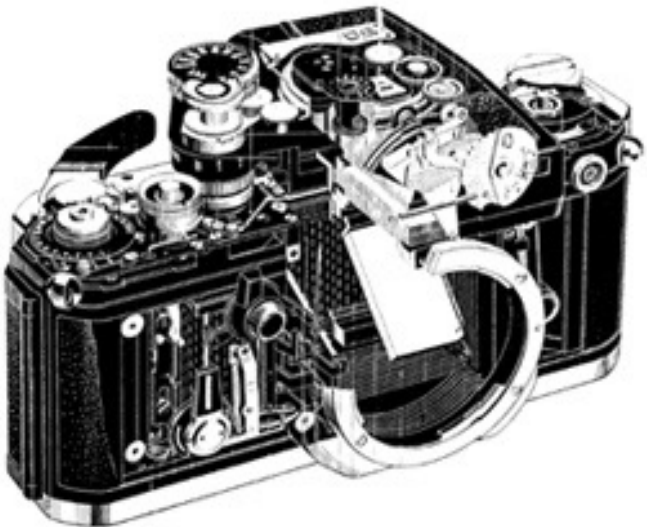
Film Rewind Switch

The only control that didn't relocate was the rewind knob!

Galvanometer housed inside ASA setting dial

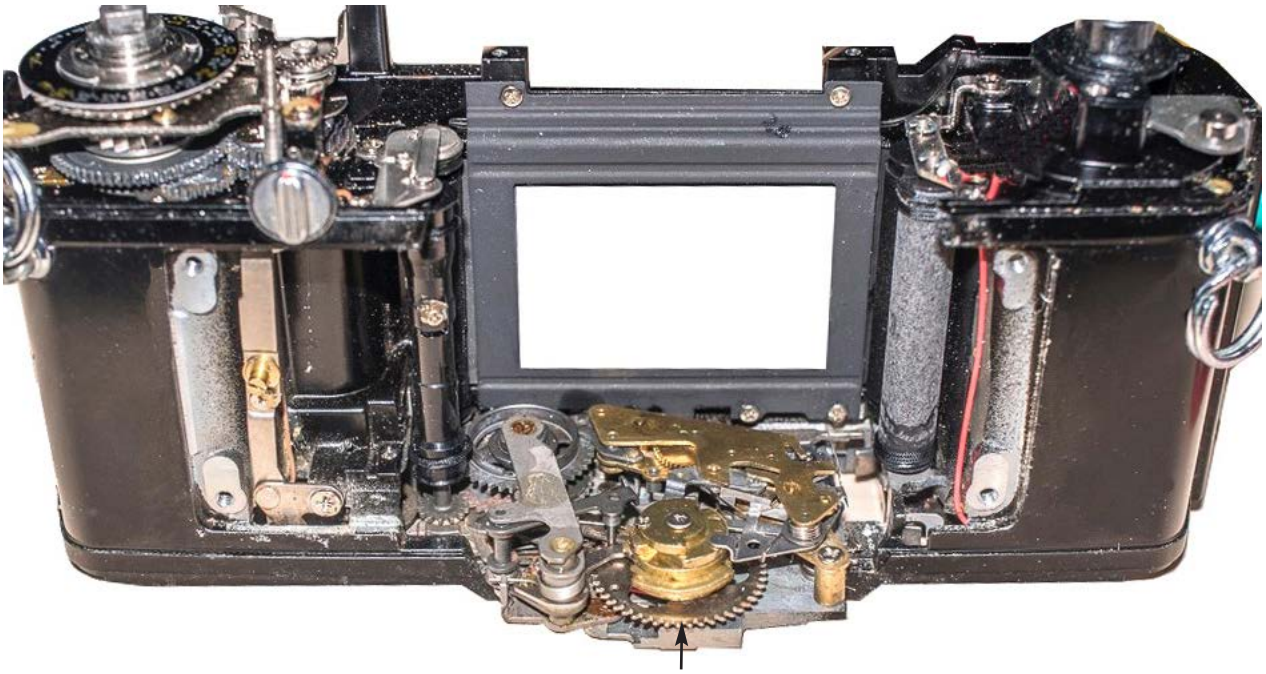
halved! It was simple to say "reduce it by half," but that was an extremely difficult goal. People would complain about the size and weight of SLRs without thinking, but the people who designed those cameras worked hard to make them as light and small as possible, and produced the SLRs that were on store shelves in those days. As you might expect, people said it was unreasonable to demand a half-size reduction.

The heaviest SLR in those days was the Nikon F, which weighed about 1.4 kilograms. Half of that is about 700 grams. I also wanted to halve the total volume, which meant reductions of about 20 percent in both height and depth. Those targets brought screams from our design staff - of course it was unreasonable! They told me it was impossible, and it was! I realized that I had set unreasonable targets when I dismantled a camera. If we made it smaller it would be weaker. And a weaker camera would not be suitable for the full-featured SLR that I wanted to create.



Nikon F2 camera: Nikon decided to fit the CDS Cell, and Galvanometer inside its interchangeable finders perhaps to allow future upgrades.

The path to a compact SLR would require the efficient use of underutilized space. The interior of an SLR is not all crowded; there are crowded areas and empty areas. The crowded areas are those containing the core functions, such as



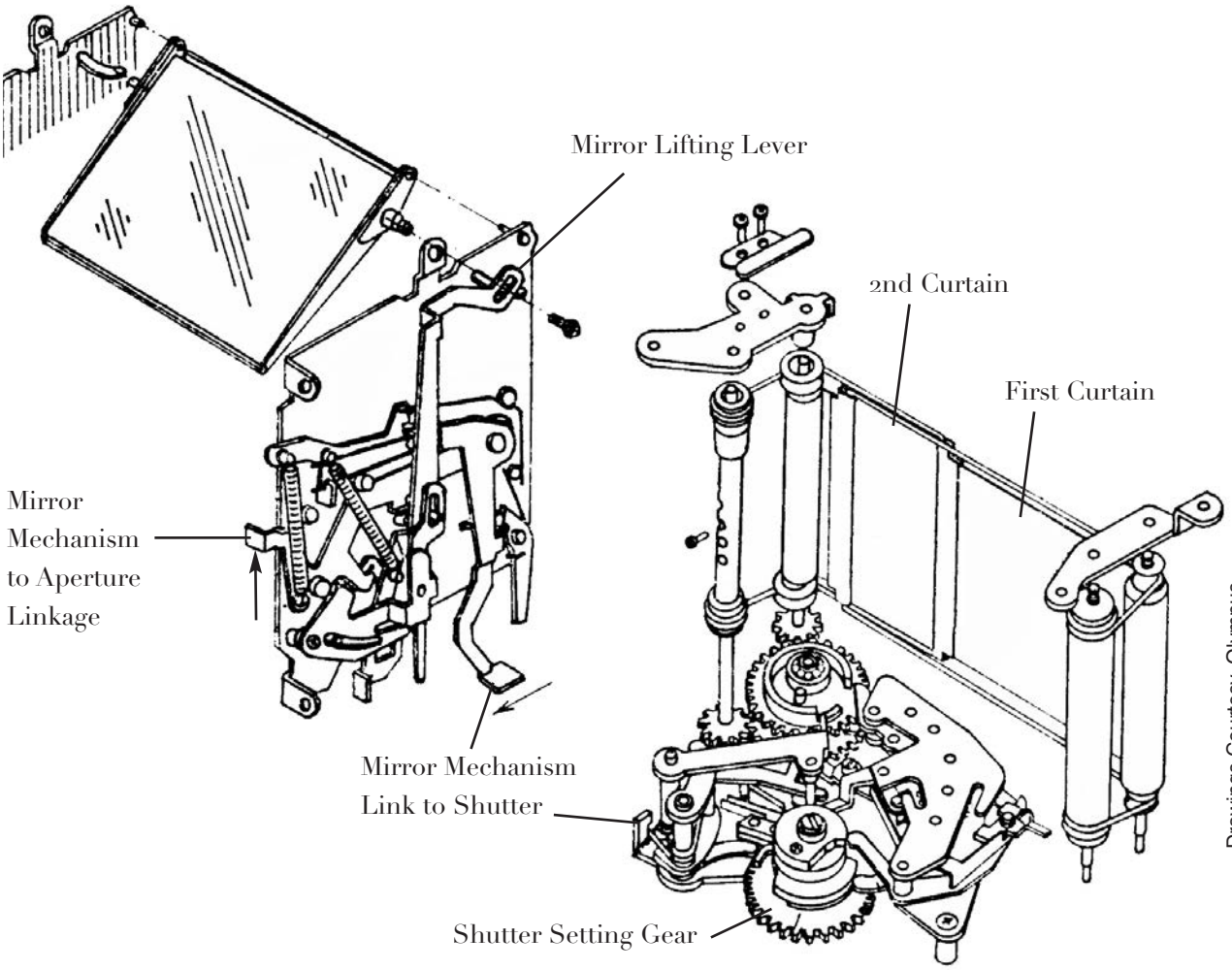
Maitani's design team relocated everything (except the rewind knob!) inside the camera to fill every unutilized area to reduce overall size, and weight. The M in OM-1 stands for Maitiani, and the O for Olympus. Above, the shutter speed control mechanism was initially conceived to be moved to the bottom of camera, but how to control it came later when the idea of using a ring behind the lens to set the shutter speed hit their minds. This gear engages directly with shutter speed seting ring behind the lens (just like in Hasselblad).

advancing the film, releasing the shutter and changing the shutter speed. These areas can be likened to the central administrative district of a big city, like the Kasumigaseki district in Tokyo. Nowadays we have digital cameras, and the signals simply pass through wires, but in those days everything was mechanical. All the signals had to be connected, so these areas were very crowded.

Around this time the Japanese government was talking about relocating Japan's capital functions away from Tokyo. This gave me the idea of relocating some of the core functions in the camera. But where could we put them? The area beneath the mirror was furthest away from the core functions, but it would be extremely difficult to move the functions there. It would have been simple with today's electronic technology, but everything was mechanical back then, and all the mechanisms had to be connected."

Olympus OM-1, the worlds most compact 35 mm system SLR camera with interchangeable lenses, focusing screens, auto flash, and attachable motor drive, etc.

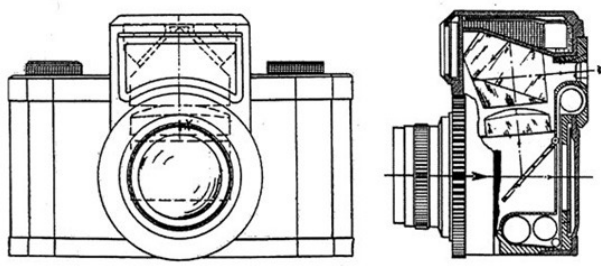
Below: How Olympus acheived its substantial size, and weight reduction in OM-1 design was by placing the galvanometer in place of shutter speed dial in ordinary SLR cameras, and placing the shutter speed mechanism below the mirror housing. This area is the empty area in most cameras, and it is where the tripod socket is positioned.



The European Design Origin

The war caused enormous hardship for European manufacturers specially those in Dresden, Germany. Carl Zeiss for example, had filed a patent for the penta-roof prism in 1941, and had produced a SLR called Syntax with Contax II shutter. Due to severe bombings of Zeiss-Ikon works in Dresden in Feb 1945, it destroyed most of the drawings, and production tools to produce the camera, and later Zeiss had to redesign it to release Contax S1 in 1949. It is not too far from the truth to say Rectaflex was engineered based on Zeiss drawings, and patent filed in 1941 but Rectaflex became the first to release it to the public in 1948.

Carl Zeiss Building in Dresden before Feb 1945 bombings. Note the resemblance of Pentacon Logo with Zeiss tower.



1941 Patent drawings for the Contax camera reveals pentaprism

Above, destruction of Carl Ziess plant in Dresden after the Feb 1945 bombings.

Contax S

Wilhelm Winzenburg, Designer of Contax-S (center) with directors Neudeck, and Fichtner

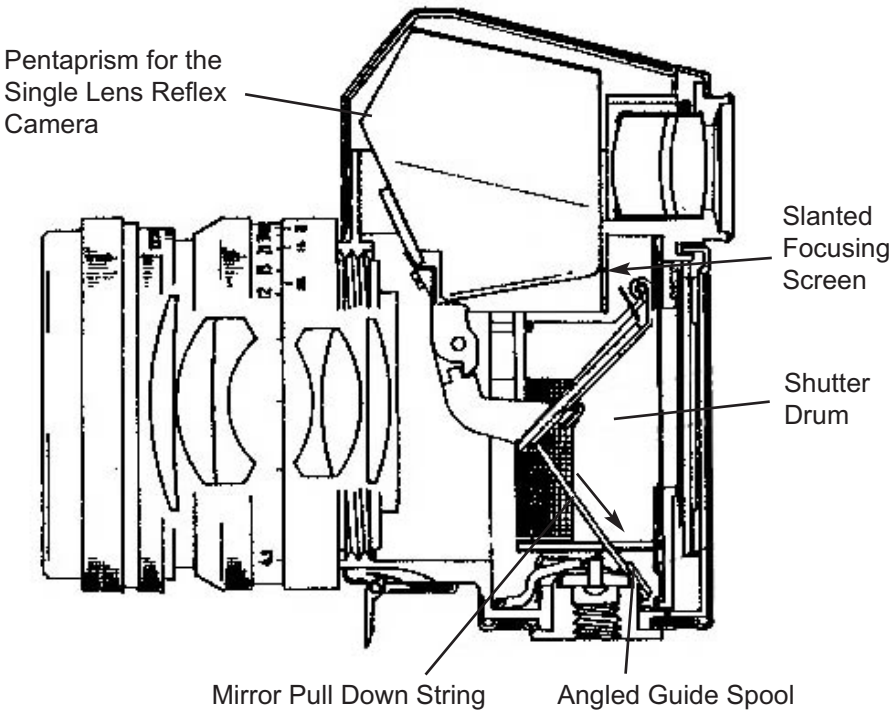
One of the best cameras to study from is Contax S (above) by Carl Zeiss, and later by Pentacon. You'll find the same easy access to the shutter curtains in Praktica (discussed next). With back cover open, just remove four screws to pull off the film gate, and the entire shutter curtain, and rollers assembly will be exposed. For reflex viewing in Contax S, they added an additional spool below the first curtain drum to pull the mirror down via a cloth string (bottom of next page). Before shutter release, the spool is released to let go of the mirror before the exposure.

After division of East, and West Germany, Zeiss Ikon in Dresden with 3400 employees fell in the hands of Soviets, and their best technicans fled to Stuttgart, Western Germany. The Spiegel-Contax (mirror Contax) was reworked by the remaining team in Dresden lead by Wilhelm Winzenburg (1895-1972), and was presented in 1948 at Eriks fair in Sweden, and caused a real shock to Zeiss Ikon Stuttgart. No one expected Dresden lacking key personel, and the benefit of free market to achieve this miracle.

After the war, the Japanese Canon / Nikon / Asahi Pentax entered the SLR market, and while Western Ziess Ikon branch introduced many modern versions of Contax S, such as Contaflex (1954), Contarex (1958), and Icarex (1966), Carl Zeiss had to leave the table to the fierce Japanese competition. Some camera experts consider the Contarex as the best 35 mm camera ever made.

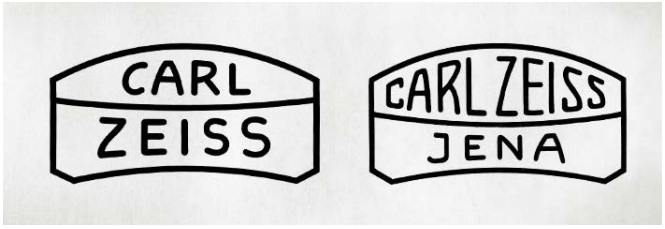
Penta-Roof Prism

The invention of penta-roof prism was one of the breakthrough designs for the 35 mm SLR. This allowed eye-level viewing through camera's viewfinde with correct left-right orientation of the image. Without the penta-roof prism, views of vertical shots become upside down. Hand held images without this prism causes horrible drowziness, as some describe it as being in a small boat in the sea!



While Soviets complained that after the war they only saw some tool room lathes when they arrived in Germany, and American had taken everything, with 300 train wagons of documents, they certainly got a hold of some Carl Zeiss documents, and tooling. As most of the American space program was inherited from Germany, so much of the camera, and optics technology were taken by the soviets. The creation of Kiev factory began few months after the war, and was based on Contax I, and II blueprints found in Zeiss factory in Dresden.

Kiev was the most important industrial city of Ukraine, and moving the Ziess, and Leica factory to Kiev to produce cameras from captured machines must have been very advantageous to the soviets. Photographers arrived in these two factories, and took photos before dismantling everything to transfer to Soviet soil. When the goods arrived in Kiev, they were not fully operational, and incomplete. Many of the boxes labled "Carl Zeiss" disappeared while passing the polish border. The transfer of technology, and rewriting the documnts in Russian cost half a million man hours, and 18.59 million Rubles.



Left, trade mark disbute between Carl Zeiss east, and west was one of the longest court battles in European history.

A factory worker, Klaus-Eckard Riess recalls his work experience at Zeiss during the Soviet occupation: "Later on, I worked for more than one year in the department where the prototypes of the new cameras were manufactured. It was very exiting to follow the development of a new camera from a wooden dummy to the finished product. As a very young and still rather unexperieced technician, I admired my skilled colleagues. Each of them was an expert. One was the specialist in making top covers. He was able to convert a flat plate of brass into a prisme-shaped SLR cover. Another technician milled the camera´s body out of a block of aluminium. When he received the drawing, he studied it for 3 days and coloured different areas before he started the milling. It took him about 3 weeks to make the body of the Contarex."

Pentacon's logo with iconic Carl Zeiss tower

After the war, German patents were worth nothing. Only Leica seemed to stay influential. The Russians, Japanese, and Italians copied German cameras without much impediments. After WWII, the German camera industry had to start from scratch.

The Focal Plane Shutter

If you would like to study a focal plane shutter in action, open the rear cover inside the film housing in Contax S, Praktica, or Rectaflex camera. It's only by removing four screws, and you could see the 2nd curtain moving so slowly at the 1 second speed, delayed by retard mechanism, and how it quickly closes as it starts to enter the aperture.

Contax S

Praktica

One of the most enduring stories concearns Praktica's owner John Noble. In 1938 John Noble, who had migrated to US in 1922, purchased Kamera-Werkstatten, a small camera factory in Dresden, and being a German origin, he decided to go back to run it. He moved the company to a near by city, Niedersedlitz. Praktiflex was introduced in 1939 at the Leipzig fair.

On February 1945, the center of Dresden was destroyed by the British, and American bombings, and 80% of the photographic factories were demolished. Praktica, being outside of Dresden received minor damage. When Soviets occupied Dresden in 1945, Charles Noble, and his son John decided to go back to reclaim the factory but they were arrested. They began an odyssey through Soviet concentration camps for almost 10 years.

In 1952, his son was released, and John was released in 1955, and could return to US. In 1946, designer Signfried Bohm was transferred from Zeiss Ikon to upgrade the Praktiflex cameras (identified by the release button in front). He was commisioned to design a modern camera, and in 1952, his team released the very affordable Praktica. In 1964, the company changed name to Pentacon with Zeiss Tower Logo. In 1990, after unifocation of Germany Charles Noble got his company back. He introduced the Noblex panorama camera. John Noble passed away in November 2007.

Siegfried Bohm (1921-2016), Designer of Praktica

John Noble (1923-2007), and his son Charles

Noblex panoramic camera (1992)

Praktica Super TL, my childhood camera

OMiD Museum

After my M&A deal with Edmund optics, they had me sign a non-compete agreement for 5 years. During these five years, I thought wow, what's be better to do than spending time with my mother back home. OMiD museum was what I ended up doing with the money, which is now home to many classic cameras, and optical instruments. There's also a mini cafe where I could serve tea, coffee, and cookies free of charge. It turned out to be so unique because most museums lack a resident author like me, who is willing to dismantle every piece of their valuable collection to explain their inner workings. Well, my mom passed away after three very memorable years, and I also met the love of my life and got married.

Visiting home had a huge impact on me, as it's foretold in the book: "Laufcadio, the lion who shot back", by Shell Silverstein. At the end of that book, Laufcadio is asked to shoot at other lions during a lion hunt in Africa. He says: "I can't shoot at them". Then he is told: "Well, you'd better make up your mind: You'll either shoot at them, or we're sure gona shoot you!" Laufcadio drops his gun and walks away, and behind him, he hears hunters shooting at lions, and lions attacking hunters.

Many museum curators that I was acquainted with supported the idea of establishing a museum here. They all believed the idea of bringing talents to US from abroad was a mistake: "We should provide them with opportunities to stay where they are to help their own people." Most country leaders in the Middle East believe people can't think for themselves. This is what the tyrant said to "Magnificent Seven" (the movie): "Do you know what your problem is? You gave these people too many choices. I gave them only one choice; Just do as I tell you!"

Well pretty soon I know I have to shut this place down, and put my cameras into boxes. As Steve Jobs puts it, being a hippie pays off later in life. This gave me the opportunity to write my three books, and I also started this magazine which I could have never found the time living in the bay area. Above, OMiD museum receives quite a few foreign visitors throughout the year.

Zenith-C is a Russain built SLR. It is an exact copy of Leica III shutter with a mirror box, pulled down by a string.

The Afshari camera: I built it right after my high school. When Dr. Ogura of UOT saw this, he said: Auto Focus!

Arriflex S with three-lens turret, and a variable speed motor offers reflex viweing by a rotary mirrored shutter.

Bronica C with a deeply seated Nikkor lens. The mirror in Bronica swings down instead of the normal up in a SLR.

Contax IIa designed by Heinz Kuppenbender, the only camera with a segmented shutter like a roll-up door.

The mirror in Focaflex moves down, instead of up. This keeps the body very slim with a flat top.

Leica SL2 motor drive is built like a tank. You can't stop the motor by pulling on the film with your leg against it!

Victor Hasselblad paid a year's sallary to his employees to develope his world famous medium format camera.

Graflex camera, full featured SLR with inter-changeable backs from the early 1900's is identical to Mamyia RB-67, with revolving 6x9 film back

Left, Nikonos underwater Camera, with single blade metal focal plane shutter.

Robot spring driven camera was the go-pro equivalent camera in 1930's. It fired, and advanced the film at 2fps.

The Wrayflex camera is probably the most affordable hand made camera compared with the $2.5M Leica.

Canon AE-1 revolutionaized low-cost camera manufacturing with microprocessor based designed circuitry.

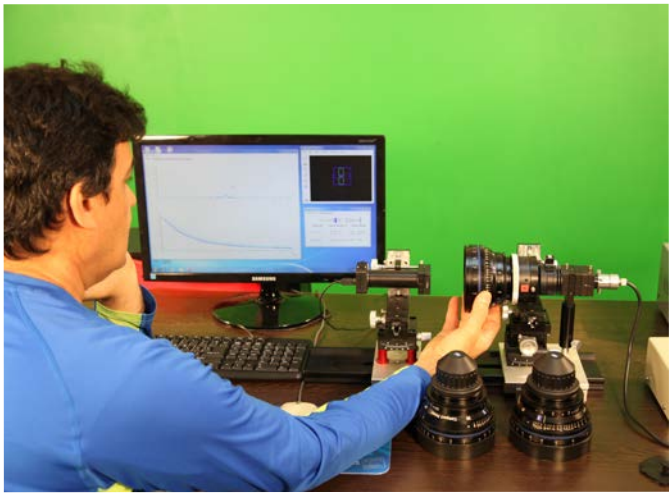
The minox camera designed by Walter Zap is a pocket watch scale design, and manufacturing.

Nikor-F was the first camera that put Nikon on the map.

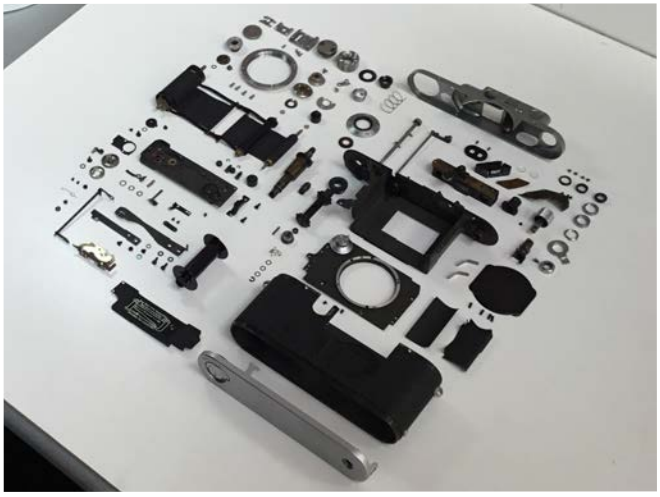
Polaroid SX-70 was invented by Dr. Land. It utilizes an elliptical mirro, and a down flipping large mirror.

Canon Sureshot was sold in the millions with built-in flash, auto focus, auto exposure, auto film advance mechanism.

The first Leica SLR was visoflex. It was actually a mirror box attachement their rangefinder M2 or M3 bodies.



Lens resolution testing using the Pearl projector (right), and MTF testing (left) for cinema optics is one of the capabilities of OMiD optical lab. I learned so much more about cinematic lenses, and how to improve their performance.



Leica shutter disassembled (left), is then arranged on a table (right) to photograph under a camera for documentation. Three new books will be published about camera design, and its history: “Leica Design 101”, and “Restoring the SLR, the marvels of SLR design, and engineering” Volumes 1 and 2. Both books will be available to get from Amazon.com

Student Projects at OMiD

Precision watchmaking parts, and clock restoration is joyful for the youth, and making skelaton watches. Above-left, a wooden watch case is built by Miss Nastaran Karimi (right) to house a custom watch. She now works at Rolex in Tehran.

Events Calendar

January 2018

Photonics West, Bios

US, San Francisco 01/27-02/01

February

Astro Fest Europe (Telescopes)

Feb 9-10 Kensington Center, London

Photonics Russia

Russia, 2/27-3/02

March

Photonics China / OFC

Shanghai, 3/14-16 /San Diego 03/13-15

April

Analytica

Munich, Germany, 4/ 10-13

NAB Cinema and Televisn

April 6-11, Las Vegas

May

CLEO

US, San Jose Convention 5/15-17

June

Inotex

Tehran, 06/29-07/02

July

Inustrial Export Russia

Yekateringburg, 07/10-12

August

Photonics San Diego

US, San Diego 8/21-23

September

Photokina

Sep 26-29, Cologne, Germany

China Optoelectronic Expo

China, Shenzhen 9/5-8

Photonics India

India, Bangalore 9/26-28

October

Interopto Japan

October 17-19

November

Leipzig Watch and Clock Fair

Oct 1-3 Leipzig, Germany

Medica Trade Fair

Germany, Dusseldorf 11/12-15

December