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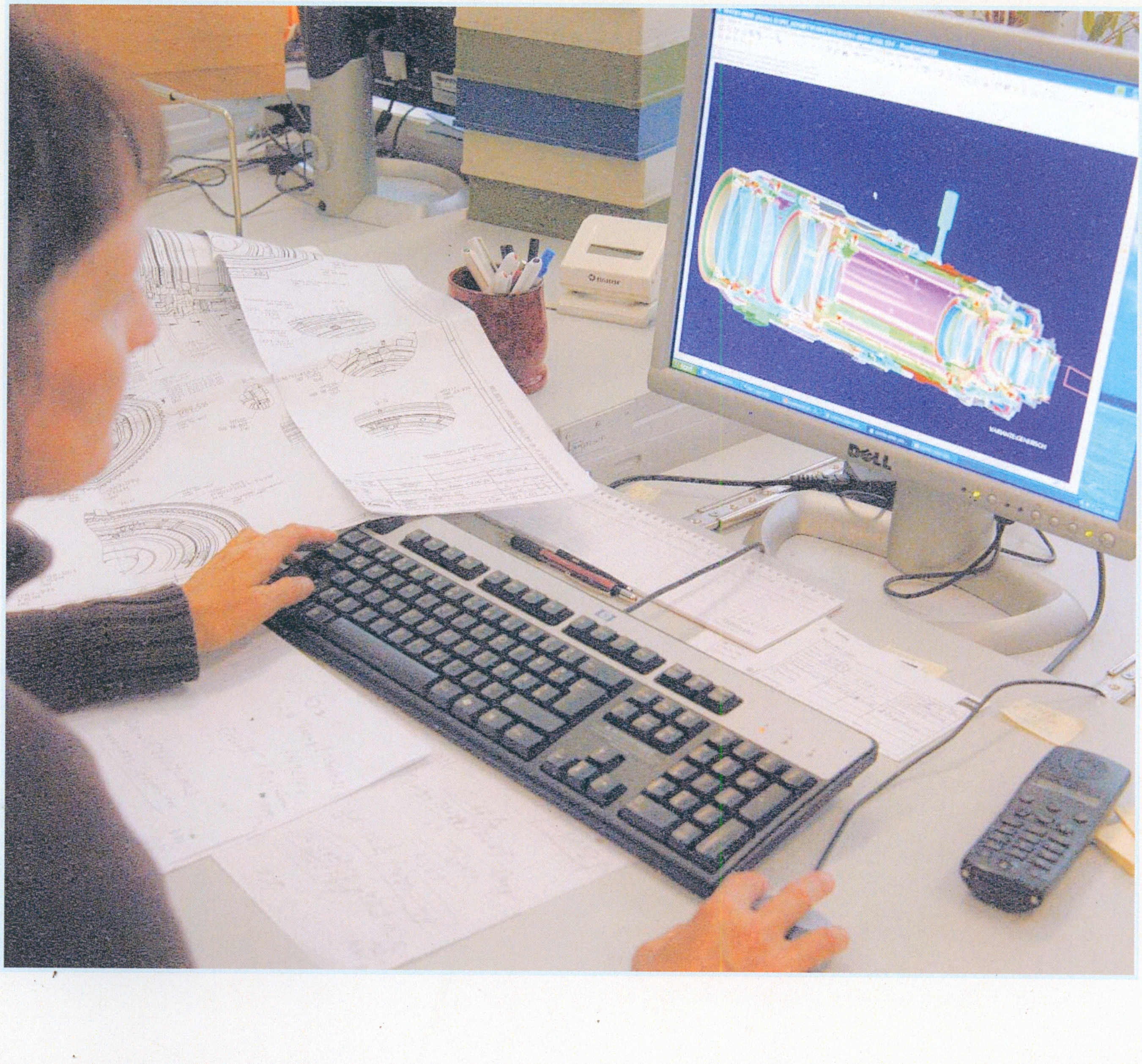

Zeiss Historica, Volume 34, Number 1, Spring 2012

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The Zeiss Historica Society of America is an educational, non-profit organization dedicated to the exchange of information on the history of the Carl Zeiss optical company and its affiliates, people and products from 1846 to the present.

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Front cover: Modern computer-assisted lens design. Hubert Nasse, in his article starting on page 9, discusses Zeiss wide-angle lenses originating at much earlier periods.

Back cover: First-day covers issued to mark the centennial of Carl Zeiss Jena in 1946. Because economic conditions at that time were not good, further celebrations were held ten years later for the 110th anniversary and in 1971 for the 125th anniversary. (From Larry Gubas.)

President's Letter

Greetings from the desert. We have already had a few 105° F (40° C) days here and I am looking forward to the summer heat keeping me inside as I work to complete my writings on Zeiss and Photography. It is quite a job rounding up images and text. I began with Dr Rudolph's Zeiss Anastigmat lenses in 1890 and I have just arrived in 1949 with the announcement of the Contax SLR camera at the Leipzig Fair. I have much more to do before it is done to reflect the time between then and now..

I have news of a new book being published by Dr Wimmer of the Carl Zeiss Archives which deals with the tedious and inflammatory days of the reunification of Germany and the uniting of the firms of Carl Zeiss in a most precarious time for both Zeiss Oberkochen and VEB Carl Zeiss Jena and all of the widely different subsidiary firms in East Germany . It is well done and illustrated. I was fortunate enough to secure a review copy but I do not yet know how it can be ordered. It is entitled "Birds of a Feather, 20 years of Reunification at Carl Zeiss." It will be available in both German and English editions and I promise to get details by the next edition of the Journal.

With regard to the Bernd Otto book, it has not yet been published and those of you who expressed interest in it to me, should send me a reminder as I cannot find the list. It is lost on my desk somewhere. It will be a huge book and expensive to forward via the mails. We did not get sufficient interest to justify a special mailing to me to re-route to those interested but I am seeking to let you know of its status once the printing is complete.

We have a nice variety of materials in this issue from folks other than me. I promise that I still have a few items of interest to add to the next issue but I appreciate those of you who have expressed themselves with unique fare in this issue.

I thank those of you who took the time to comment to the editor or myself on our selection of the early Contax DVD for a dividend with our last issue. I had forgotten to mention that it was provided to us in DVD form by one of our international members, Fritz Takeda of Japan. It was nice to see and understand the advanced manufacturing that Zeiss Ikon provided in the pre-war years. If anyone has knowledge of other interesting visual material, please share it with us and the Society will take steps to copy it and distribute it to the membership. It would be a nice surprise to find another interesting visual item of either the pre-war or post war eras.

In this issue, Warren Winter has taken the time to cover one of the most explosive collectibles of our current era. Old Zeiss magnifiers are selling on eBay at incredibly high prices. I am looking forward to seeing what he has documented. Our editor allows me to be treated as a true member and receive the Journal with total surprise about its contents.

Lastly, some 11 years ago, I undertook the task of developing a website for the society. I bought a piece of now obsolete software and created what is now www.zeisshistorica.org. Frankly, I no longer have the software (these products become obsolete very quickly) and since I am now 70, I no longer have the patience to learn new computer processes. My former prowess with MS Word and Excel is fading as well. Is there a talent in the membership that could take up the torch of helping modernize my old work. I can provide text and images but I cannot put it all together for the Internet any longer.

Keep in touch,

The Contax bayonet lens mount: Trying to make a virtue out of necessity

Volkmar Kleinfeldt, Tübingen, Germany

The lens mount, with its inner and outer bayonets, may have been an error of judgment by Zeiss-Ikon that contributed to loss of market longevity to Leica.

In 1932 the first Contax to reach the market had a quite unusual feature; the lens mount came with both an inner and an outer bayonet. Why was this? What are its good and bad points?

To try to understand the design we have to think back to a time when the wide range of lenses we have today lay far in the future, and when the possibility that lenses of various focal lengths would be used seemed quite exotic. In those days one took photographs with a lens of "normal" focal length, corresponding to approximately the diagonal of the negative format, which allegedly yields the angle of view of the human eye. A great number of plate and rollfilm cameras were sold in those days with a lens of such a focal length, and so it was natural that the first Leicas were provided with similar lenses — 50 mm for the 35 mm format. No interchangeable lenses of other focal lengths were made until later..

The Leitz Hauptkatalog of 1930 seems to be almost apologizing for this state of affairs. "If we took notice of the repeated requests by Leica enthusiasts and provided lenses that could be used alternatively to the proven f/3.5 50 mm Elmar lens, we would tend to disparage the previous models with the standard lens, which we believe already has the most appropriate focal length and aperture for miniature photography."

> This article is derived from the contribution by Volkmar Kleinfeldt to *PhotoDeal* III/2009, where it appears in German. I have made this rather free translation into English for publication here. The insights are all Kleinfeldt's, but errors or distortions are my responsibility. I thank Rudi Hillebrand of *PhotoDeal* for supplying copies of the illustrations. —*J.T. Scott*

When the Zeiss Ikon Contax arrived in 1932 it came with a similar interchangeable lens, known of course as the "normal" lens.

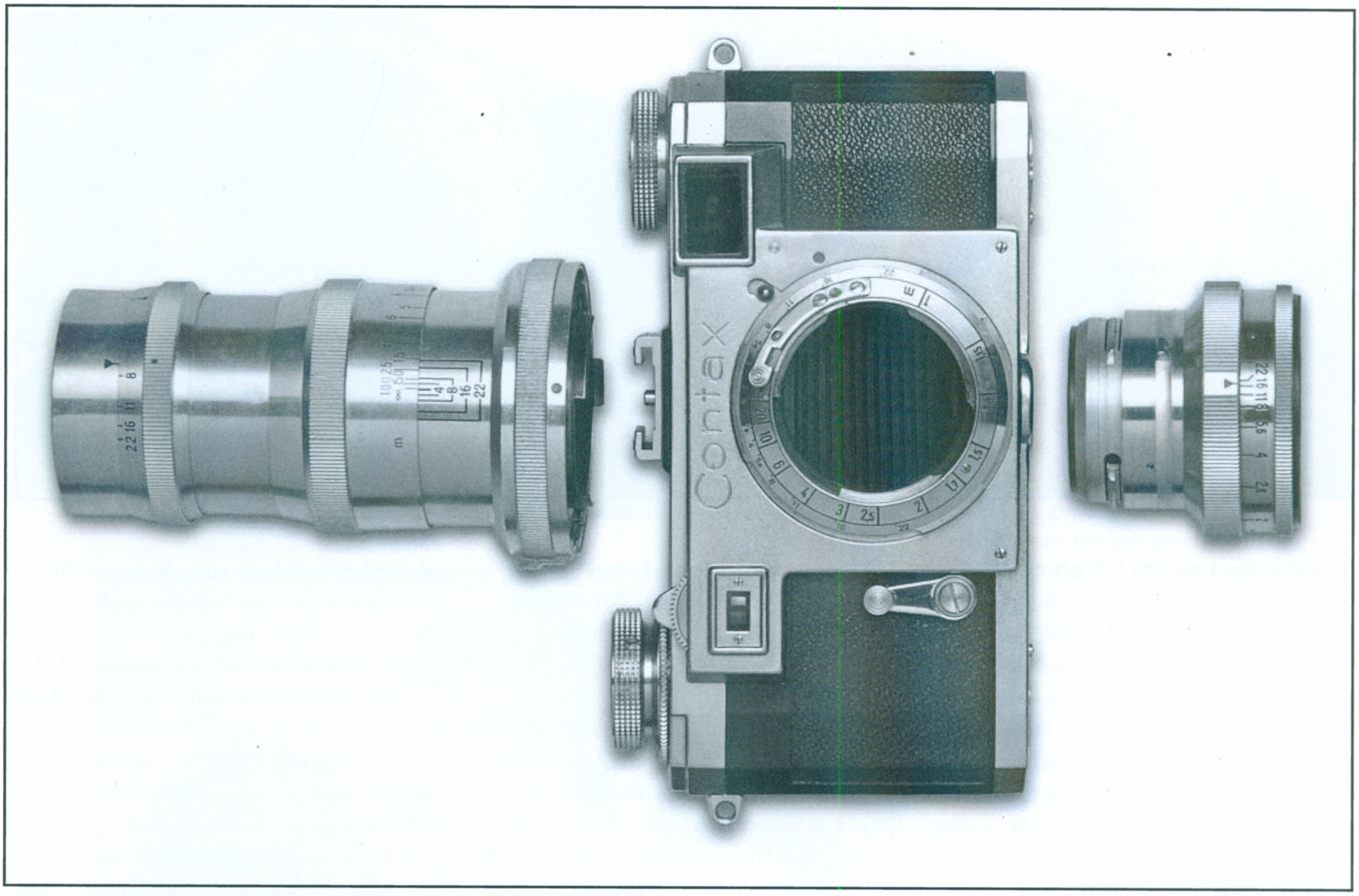
The advantages of having different focal lengths, which would have permitted the ability to change perspective, foreground and background, small or large depth of field, and so on, were not yet sufficiently recognized. Commercial photographs of the period always show images with the same angle of view. Wide-angle exposures, for which the so-called normal lens was too long, or distant subjects, for which you need a longer focal length, were just not possible. That was that! The camera along with its 5 cm lens was seen as a unit.

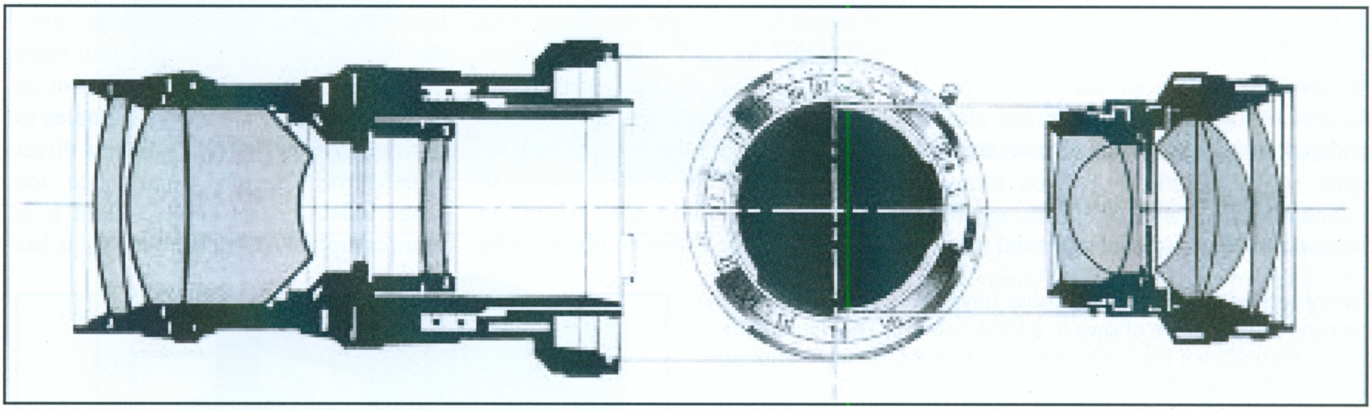
The mechanical part of the lens that adjusts the rangefinder via the inside bayonet was regarded as part of the camera, not of the lens.

For and against

Now let us look at some of the arguments used by Zeiss Ikon during the development of this system, in its favor:

The control wheel for the rangefinder. This was supposed to be useful for very precise focusing, and users were expected to use it, with the first or second finger of the right hand, for that purpose. But it was not adopted in practice; it was found to be too cumbersome. Each pho-





These photographs and cross-sectional drawings (taken from Zeiss publicity materials) show a 13.5 cm Sonnar with the outer bayonet and a 5 cm Sonnar with the inner bayonet ready to mount on a Contax IIa.

tographer just took the Contax lens barrel between thumb and first finger and turned it until the rangefinder images coincided. This method is slightly awkward because the "infinity-lock release" gadget is situated next to the unused adjustment wheel on the camera body, and you have to keep moving your index finger there before setting the distance again every time you reach infinity.

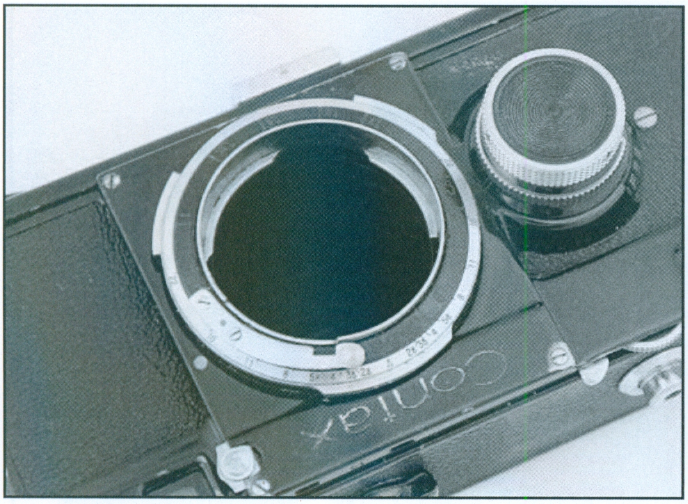
The rangefinder mechanism is fully protected within the camera body. This was of course a clear dig at the Leica, but from my 60 years of experience in the photographic trade I know of no case where the free horizontal movement of the Leica rangefinder was damaged.

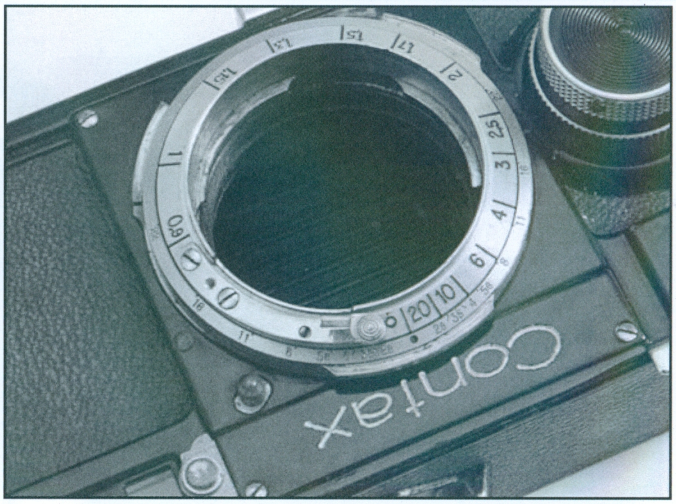
Disadvantages versus Leica

But there were also excellent arguments against the design of the Contax system: The actual focal length of each objective may not be as specified; the permitted deviation was plus or minus 5%. And this actual focal length of each lens should, in principle, have been matched to the focusing mount of the camera. In the Leitz lenses, there was a number to adjust the focusing distance, often misunderstood as a "quality key," which allowed each lens to be "tuned" to the mount.

This feature was not provided in the Contax system, as Leica enthusiasts enjoyed pointing out.

For the Contax the focusing action has to be very smooth to allow any rotation at all (even with a 50 mm lens) if you





The Contax I on the left above (photo by J. T. Scott) is a version 4, and has no infinity-lock release button on the front plate. Later Contax I, such as the one on the right, and all other Contaxes, have the button alongside the lens mount and near the "X" in "Contax."

used the focusing wheel on the camera body. Should there be any stiffness the lens would wobble a bit during the focusing process, with the result that focusing precision might not even be as good as when you used the focusing scale.

The rotation of the lens not only affected the then relatively rare use of a polarizing filter (such as the Carl Zeiss Herotar, or, later, the Bernotar) but also hindered one's ability to read the aperture scale.

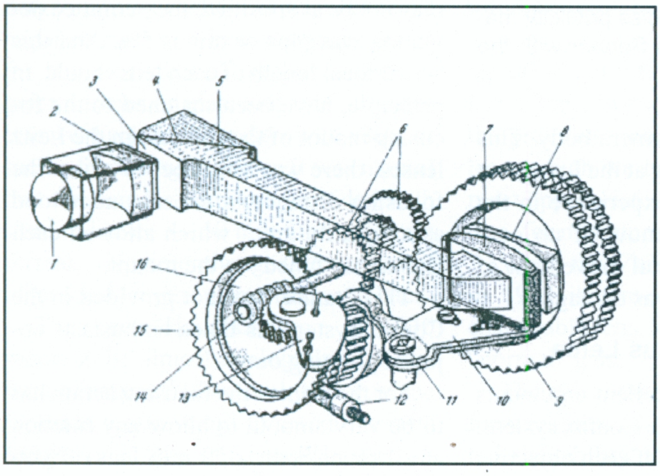
You had to constantly turn the whole camera around to find that scale and read the set value, even though the scale was duplicated 180° around the lens barrel.

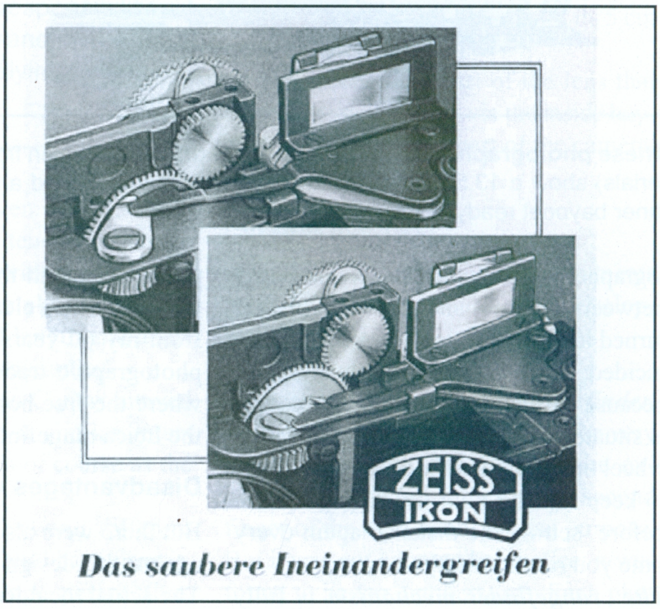
With the so-called "exotics," lenses longer or shorter than the "normal" focal length, the situation was better. These lenses are attached with the outside bayonet, which does not have an infinity lock in Contax I, version 5 and the later Contax models and so allows easy focusing from far to near. (In the first models of the Contax I there is no infinity-lock release pin on the front of the camera. In variants 1-4, the infinity-lock release on the top right of the camera body must be pressed even when using lenses with the outer bayonet. The infinity-lock release on the left front panel next to the lens mount was added only on versions 5-7.)

But the questionable focusing wheel can no longer be used, because it transmits insufficient force, through the gearing, to turn the lens. Each lens had its own customized focusing helix.

This outer-bayonet system does have one advantage. Within the rotating lens barrel there is a smaller-diameter cylinder whose rear end engages with three cutout segments in the inner bayonet on the camera, and this rotation couples to the rangefinder. There is thus a direct transfer of the lens rotation to the rangefinder. In the Leica system it is more complicated; because each lens has

Portrayed with pride, the double bayonet and its linkage to the rangefinder were shown in a1954 catalog. The illustration on the right shows the "neat meshing of the gears..." required to couple the two mounts to the rangefinder.





A group of lenses showing the two bayonets: The top and middle photos both show a 5 cm retractable Tessar and the 5 cm f/1.5 rigid Sonnar; they have the inner bayonet. At the bottom are three "long" lenses with outer bayonets: A Sonnar f /2 8.5 cm, a Sonnar f/4 13.5 cm and a Tele-Tessar K f/6.3 18 cm.

a different relation of focus distance to barrel rotation there has to be a system of cams in each lens, to transfer that rotation to the rangefinder.

Hans-Jürgen Kuč shows in *Auf den Spuren der Contax*, volume II, on page 82, a picture from a 1954 catalog and commented, "This shows very clearly the use of the inside and outside bayonets." You feel he was claiming the design to be something special and not something with problems. In volume I, page 59 of the same book Kuč wrote, "... in addition to these benefits there was another ... the distance could also be measured when no lens was in place."

(Kuč does not tell us what advantages are thus gained, and they may well not exist. Surely it could not have been related to expense, but even then it would only have been in the very unlikely situation that several 5 cm lenses were purchased. If they were Contax lenses without a helical they would be actually cheaper than competitors' lenses with a helical. But although the Elmar 50 mm f/3.5 was only a modest 2:00 RM more expensive than a comparable Tessar, the Summar f/2.0 would have been even cheaper, by 8.00 RM, than the corresponding Sonnar! For Leitz to do something similar the helical would have to be added along with the focusing cam, and it would not be feasible to make these changes and then add the cost supplement for T coating. Read about it in *Legends and Stories of the Photo Industry* by Hartmut Thiele.)

So wrote Kuč (incidentally, he wrote excellent books!). Standard focal-length Contax lenses have no helical, and no focusing scale, so there is no advantage in using the camera without a lens just as a rangefinder.

Gross error of judgment?

At least from today's perspective, the Contax double bayonet must certainly be considered one of the really glaring mistakes of German camera technology. Perhaps it is one of the reasons that the Contax (at least in Germany) had only a relatively short lifetime, while the Leica with its interchangeable lens system, on the market almost a decade earlier, has survived to the present day. ❐

Carl Zeiss Jena low-power binocular magnifiers

Warren R. Winter,

Mount Kisco NY

A pair of simple magnifying lenses mounted with rhomboidal prisms allows stereoscopic viewing of small objects.

Zeiss first included Binocular Magnifiers in their Medical Department publications in 1909. These devices were really simple single-lens magnifiers, coupled to a pair of rhomboid reflecting prisms that are mounted in a reversed manner than they would be in typical Zeiss-style binoculars, so reducing the distance between the viewing centers to literally side-by-side. This configuration permits viewing very small specimens in stereo (as seen in the illustration above). The reduction in this case is similar to that of the Teleater and Theatis opera glasses, but is done to permit viewing miniature objects in stereo, rather than creating a compact device. Although sold by the Medical Department, these instruments are clearly usable by any technician involved in close-up work.

Not like the telescopic magnifiers

These Binocular Magnifiers were simpler and lighter in construction than the Telescopic Magnifiers that were introduced in 1911. Those instruments were modified field glasses. For more information on the Telescopic Magnifiers see Jack Kelly's article on the Zeiss Tele-Microscope, page 11 of *Zeiss Historica*, Spring 2007.

Table 1. Interchangeable lens pairs

Magnification	Object distance	Order symbol	Price (RM)
0.72×	30	Eefun	2.75
1×	22	Eefys	2.75
2×	9	Eegat	2.75
2.5×	7	Eegbu	2.75
3×	5	Eegex	2.75

Mass of one lens pair = 5 g

Table 2. Prismatic binocular loupes with headband

For interpupillary distance	Order symbol	Mass (g)	Price (RM)
59 ± 1.5 mm	Eefga	380	50.00
62 ± 1.5 mm	Eefic	430	50.00
65 ± 1.5 mm	Eefke	440	50.00
68 ± 1.5 mm	Eefoj	450	50.00

The Binocular Magnifiers are often found today in pieces. Even though they were shipped in a Zeiss hinged wood case, some parts deteriorated and/or were lost. The original version was a simple strap-on magnifier, but this headband is usually missing or the elastic band is crumbling, due to age. Other hard-to-find components are the illuminating attachments, which frequently were outright lost, discarded or never purchased.

Choice of diopter power

In the 1923 leaflet "Med 1," the magnifiers are listed with "diopter pairs" from 0.75× to 3×. By 1936 the Zeiss Lupe catalogue shows them as 0.72× to 3× (see Table 1, which is translated and adapted from that catalogue). Buyers would select one or more of the five sets of magnifications to suit the intended use and their own eye deficiencies.

The instrument was available in four different inter-pupillary distances of 59, 62, 65 and 68 mm. The units I have seen have 62 and 65 mm spacing — the most common spacings needed by an adult. A chart that includes these options, adapted from the 1936 German-language catalogue, is shown in Table 2.

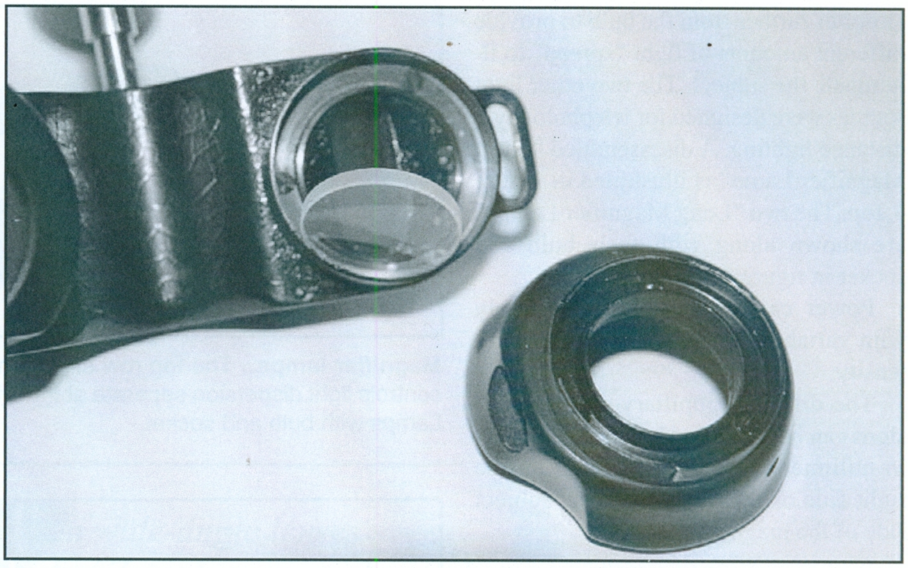
The unit in figure 1 is a 65 mm with a 2× diopter, shown leaning out of its installation point. The eye-cup is to the lower right.

In its least sophisticated incarnation, the Binocular Magnifier utilized hard rubber eyecups, as shown in the figure, but as seen in the catalogue, two types of head frames were introduced, one allowing eyeglass use with the device. A Trendelenburg Head Mirror accessory was available as well (figure 2), similar to the lit headband with a concave mirror formerly worn by physicians to concentrate light on their subjects.

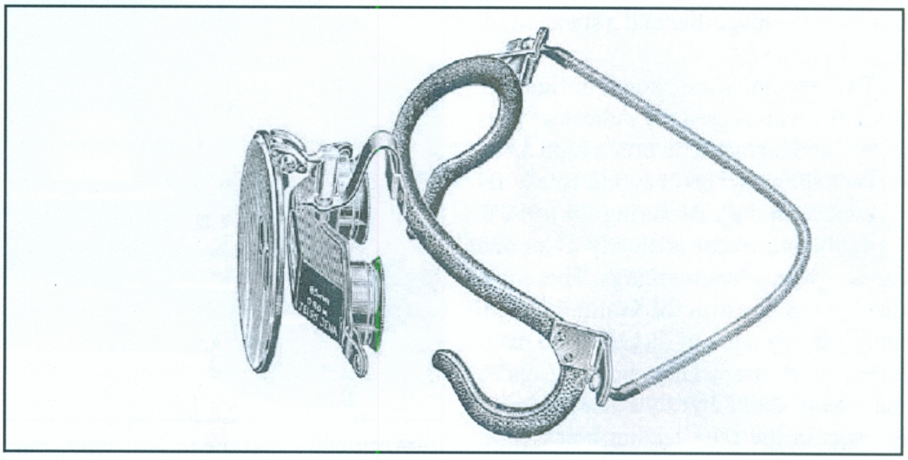
Types of lighting

Full complements of lamp housing styles covered the variety of possible uses. There were two types of fittings and three different magnifiers (see figure 3 for a close-up of the Short Magnifier Lamp assembly), each providing a different amount of light dispersion to cover the subject.

The magnifier-lamp lens housing slid



One of a pair of magnifier lenses of 2× power (top center of the photograph), shown leaning out of its receptacle, with the eye cup and retaining ring at the side. Figure 1



A Trendelenberg headband accessory with concave mirror to focus light. Figure 2

The Short Magnifier Lamp assembly fitted above the magnifier. Figure 3 closer or further from the bulb to provide different amounts of light "spread" to illuminate the subject. The two other light sources were designed for telephoto-style distance lighting. A disassembled "Short Magnifier Lamp" is illustrated in figure 4, top. The two "Long Magnifier Lamps" are shown along with their bulb and socket in figure 4, bottom.

Power came via a separate supply with variable voltage to adjust light intensity.

The different pupillary-spacing versions can be identified by the imprinting, in millimeters, seen in figure 5 on the right side of this unit (from the subject side of the magnifier).

Fitted cases

As with most of Carl Zeiss Jena products, fitted cases were available to store and transport the magnifier and a standard set of accessories.

Two examples are shown in figure 6. The open wood case only indicates "Germany" and no manufacturer's logo on its lid (not shown). This may indicate a device made in the east during the 1950's, while the other unit is clearly older and had a typical set of markings. These two cases were constructed similarly, with room for two pairs of diopters, the magnifier, head strap, lamp housing and a spare bulb. Carl Zeiss Jena also sold similar sets in the faux leather black case, with gilt lettering on the exterior.

Examples of these show up on e-Bay from time to time. Complete kits sell for $100–200, but individual components can be had for $25 to $50.

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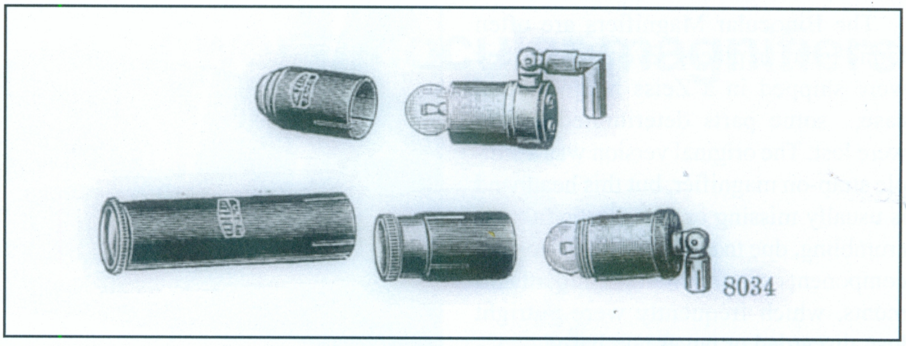
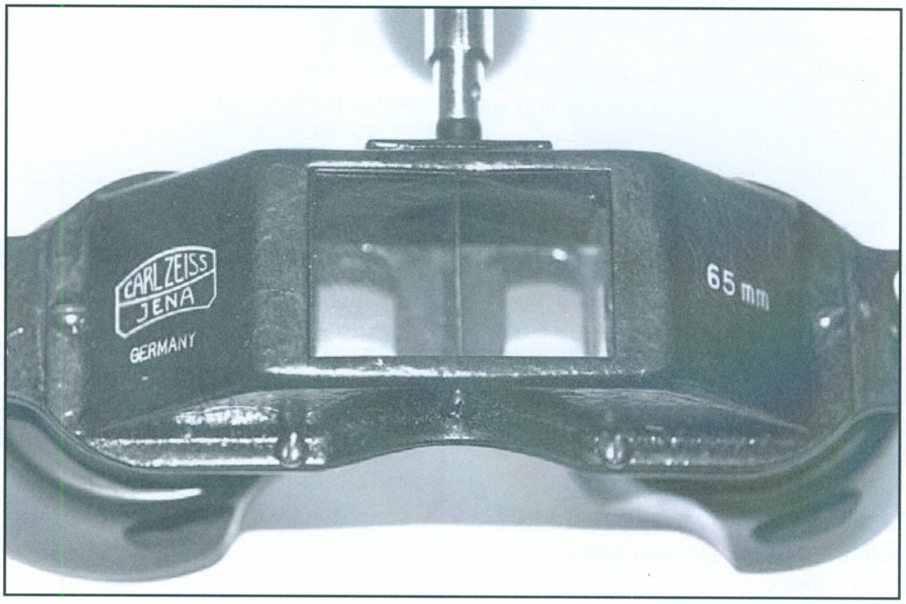
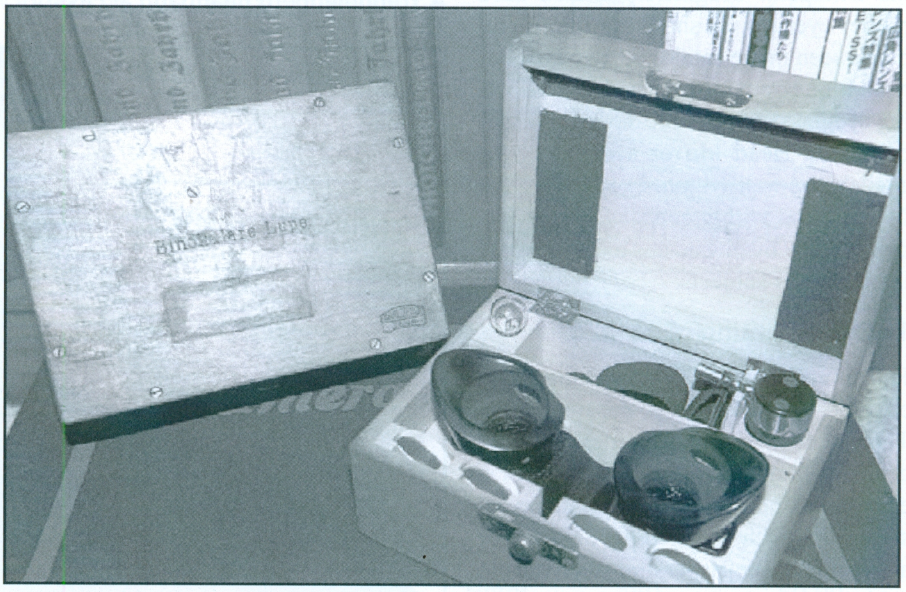


Magnifier lamps. The top row shows the short version, with the sliding piece that controls light dispersion separate at the left. In the bottom row are two Long Magnifier Lamps with bulb and socket. Figure 4



Interpupillary distances are clearly marked — 65 mm in this case. Figure 5



Two fitted wooden cases, the open one showing that all accessories were included with several sets of lenses of different powers. Figure 6

Retrofocus lenses – and why they were invented

H. H. Nasse, Oberkochen, Germany

The Distagon, Biogon, and Hologon wide-angle lenses were developed over a long period of Zeiss history, and each has a preferred field of application.

This article is *Zeiss Historica's* adapted and much abbreviated version of the original work by Hubert Nasse. The complete version, presented by the Camera Lens Division of Carl Zeiss AG, includes more technical details about these lenses and brings the story up-to-date with information on contemporary lenses. It can be found at:

http://blogs.zeiss.com/photo/en/wp-content/uploads/2011/12/en_CLB41_Nasse_LensNames_Distagon.pdf

or by searching the Web for "Nasse lens names Distagon"

Three Zeiss wide-angle lenses, Distagon, Biogon, and Hologon, have their final syllable "-gon" in common. From the Greek γωνία (gonia) meaning angle or corner, this refers to the wide angle of view of these lenses, and the syllable was also used in this way by many other manufacturers. One of the earliest examples is the famous "Hypergon" with its 130° angle of view, which the Berlin firm Goerz introduced to the market around 1900.

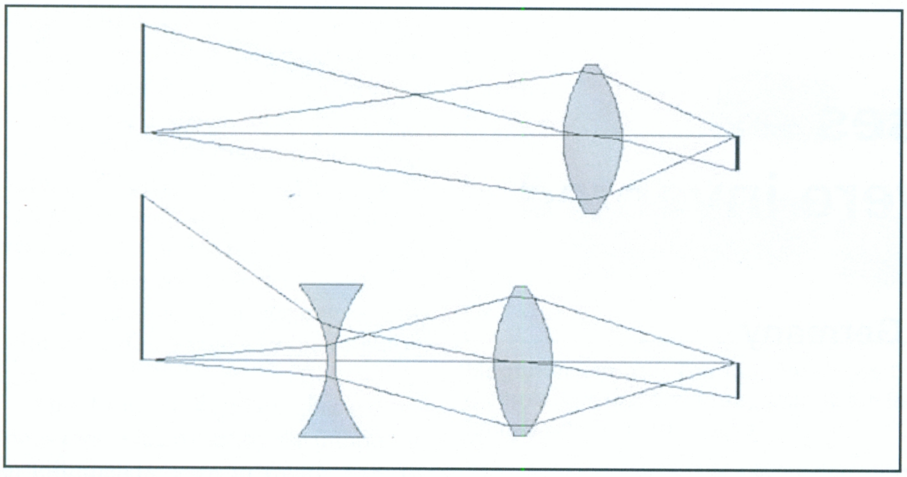
The three Zeiss lens types display major differences that we will find helpful to understand their particular properties, as I shall discuss in this article.

In photography, the term "standard lens" is usually understood to mean a lens with a focal length about as long as the diagonal of the frame size. The 24 ×36 mm format has a diagonal of 43.3 mm, the APS-C format 28.4 mm, and for many so-called "medium-format" film and plate sizes it is between 70 and 90 mm. Modern digital formats yield between 55 and 60 mm.

With a wide-angle lens, the focal length is significantly shorter than the diagonal of the frame. If it is about the same as the long side, the lens is considered to be a moderate wide-angle lens. Super wide-angle lenses are those with focal lengths between the length of the short side of the frame and half the diagonal. Those with even shorter focal lengths are often referred to as extreme wide-angle lenses, though the delineation between "super" and "extreme" is fluid, of course, and to some extent a matter of taste.

A lens with a shorter focal length can be derived from an existing one by reducing all its dimensions accordingly. Thus many small and medium format lenses look very similar, differing just in size. Of course, this "scaling" of optical designs yields a reduction of the image circle and of the distance of the lens from the image plane, which is not always desired. Thus a usable wide-angle lens is not automatically obtained, and if the focal length and image circle are reduced by the same factor, the angle of view remains the same.

In fact, moderate wide-angle lenses have been made with the design structure of conventional lens types such as the Tessar and Planar. However, if the angle of view continues to be increased and good correction for the increasingly oblique incident rays of light is desired, these designs reach their limits. Wide-angle lenses have always required new ideas and are among the most difficult challenges in optics.



The inverted telelens (below), compared with a simple converging lens above. An object on the left is imaged on the right. When a negative lens is placed in front of the basic converging lens the combination captures a wider field of view and at the same time increases the back focal length. Figure 1

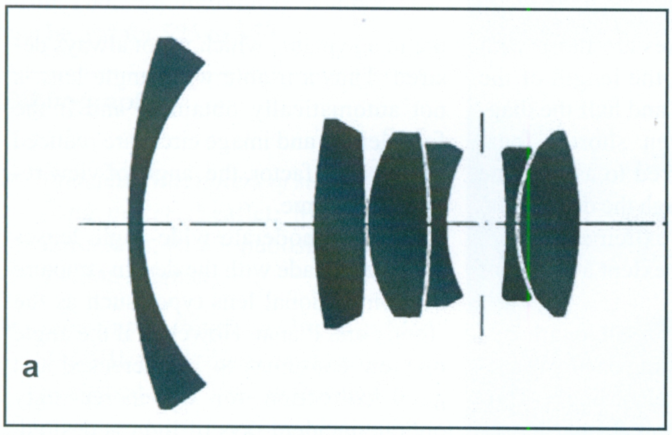
A particular problem with many cameras is that the distance of the last element in the camera lens from the image plane must not be less than a particular value, because some technical function still requires space between the lens and the image sensor. With a single-lens-reflex camera it is the mirror that redirects the image onto the focusing screen before the picture is taken that needs the space. Also a beam-splitting prism in cameras with three sensors for the primary colors (as in the Technicolor process of the 1930s and later), or maybe just the provision for through-the lens exposure metering, can require a large back focal length for the lens. In the 1930s, cine cameras often had a lens turret for changing the angle of view quickly. This function also required that the lens was not extended too deeply into the camera.

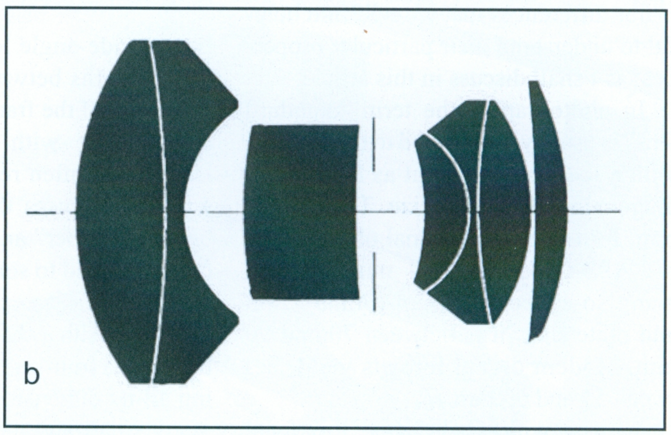
In 1950, Pierre Angénieux in Paris and Harry Zoellner at Carl Zeiss Jena applied almost at the same time for a patent covering the first lens for 35 mm reflex cameras based on the principle of the inverted telephoto (figure 1). The diverging effect of a large negative element placed in front of a standard lens increases the angle of view while slightly reducing the converging effect of the positive refractive power behind it, so that the rays do not come to a focus until a greater distance behind the last element. Thus the negative-power front lens reduces the focal length and increases the back focal length. Because this arrangement of refractive powers is exactly the opposite of the telephoto design principle, such a lens can be called an inverted telephoto. The Jena lens was given the brand name "Flektogon," and Angénieux named his lens "Retrofocus" to indicate that the focus was shifted backward. This term, originally introduced as a brand name, ultimately became a generic name for all these lenses, and it is better known today than "inverted telephoto."

There were already certain predecessors of this at the beginning of the 20th century, where such negative elements were placed in front of projection lenses to produce large projected images in small rooms. Such front converters are still available today for permanently integrated lenses.

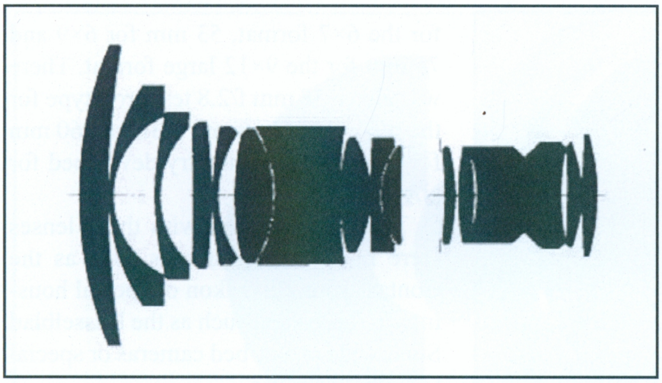
The Distagon

From the end of 1952, such wide-angle lenses were also developed at Carl Zeiss in Oberkochen, the first (figure 2a) being a 60 mm f/5.6 lens for the Hasselblad 1000F. These have borne the brand name "Distagon" ever since, the name derived from "distance" and the previously mentioned Greek word for angle. Thus a Distagon is a wide-angle lens with a large distance to the image. The Hasselblad lens was followed in 1958 by a 35 mm f/4 Distagon for the Contarex (figure 2b). The lens cross-sections show that these

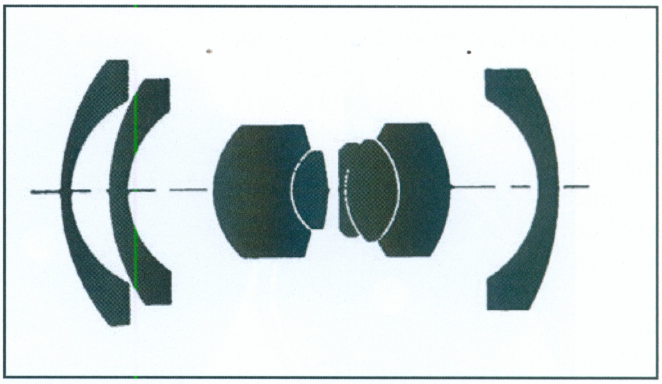




Two Distagons. The first, on the left, is the f/5.6 60 mm design from 1952 for the Hasselblad 1000F. The improved design on the right, dating from 1956, was also an f/5.6 60 mm but was later (1958) scaled to be an f/4 35 mm for the Contarex; better spherical aberration at the smaller size allows it to be faster than the original. Fig-



The f/2.8 21 mm Distagon designed in 1992 for the Contax/ Yashica cameras has 15 elements in 13 groups. Figure 3



The Biogon designed by Bertele in 1951 was available in various focal lengths. The aperture was always f/4.5 . Figure 4

wide-angle lenses were not excessively complex in design, having just six or seven elements, and they were an example of modesty with respect to speed. Today, a maximum aperture of f/4 provokes an amused smile, but at that time this was a wise limitation to ensure that the moderate wide-angle lenses offered more than just moderate quality.

As simple as the basic idea of the retrofocus lens is, the optical calculations initially faced new challenges. The strongly asymmetric distribution of the refractive power led to the occurrence of some far greater aberrations than with an approximately symmetrical lens, where the contributions from the front and back half of the lens compensate each other.

The problems are primarily coma, distortion and lateral chromatic aberration. The designers first had to learn how best to manage these aberrations, and without computer support there were limits to the complexity of the first Distagons.

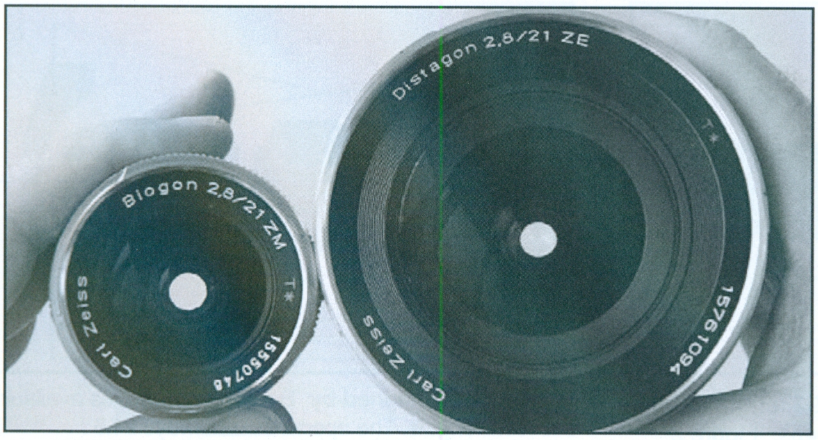
Thus the advancement of the Distagon in the 1960s and 1970s was inextricably linked with the enhancement of the optical calculation that occurred at that time. Increasingly fast computers and improvements in programsgradually enabled automated optimization of a design. In Oberkochen, Erhard Glatzel was a primary force in the application of this new tool, which resulted in many excellent Distagon designs. By the mid-1970s this progress, supported by new optical glass types with properties not previously available, enabled such good, complex lenses such as a 15 mm f/3.5, a 35 mm f/1.4, and a 25 mm f/1.4 to be built for the 35 mm SLR.

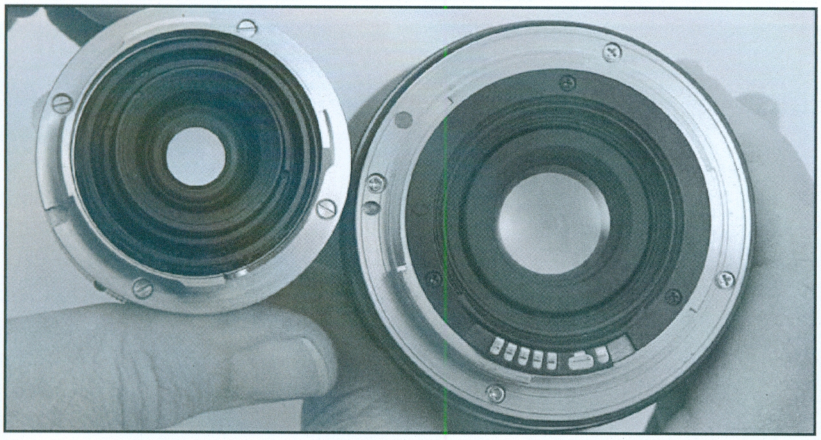
The f/4.5 21 mm Biogon (left) and **the f/ 2.8 25 mm Distagon** (right), both with Contarex mounts. The Biogon is nearly as long overall as the Distagon, but most of it lies inside the camera where it might interfere with an SLR mirror. Figure 5

Today the Distagon type is one of the most important and best performing principles of design for our camera lenses, particularly if large angles of view and a high maximum aperture are both required. Of course, the lens is then somewhat larger and more complex and thus also not cheap. But its good definition and image-field-illumination characteristics are worth the effort involved.

In 1992, Karl-Heinz Schuster at Carl Zeiss developed the Distagon T* 21 mm f/2.8 for the Contax/Yashica system, a retrofocus superwide-angle lens that was at least as good as the best symmetric types with respect to image sharpness (figure 3). This Distagon even had a related lens, the PC Apodistagon 25 mm f/3.5, with a larger image circle, which unfortunately was never produced in quantity due to its high manufacturing costs.

Already at aperture f/4, the Distagon T* 21 mm f/2.8 achieved superb image quality; thus it is no wonder that its price on the pre-owned market often exceeds the original price after it was no longer produced.





Entrance (top) and exit pupils (bottom) of the Biogon and Distagon compared. These are both f/2.8 21 mm lenses. The virtual images of the aperture of both lenses appear the same from the front. From the back, however, the images of the aperture appear as different sizes. Note that the two pupils are more nearly the same size for the Biogon on the left than they are for the asymmetric Distagon on the right.
Figure 6

In particular, it is a general characteristic of asymmetric lenses that they are more sensitive to changes in scale if no particular countermeasures are taken. The older Distagon T* 25 mm f/2.8 focuses by means of an overall movement without variable air spaces, and therefore it cannot be seen in any way as a macro lens despite its very short minimum focus.

Symmetrical wide-angle lenses

If the design of the camera permits elements of the lens to be placed fairly close to the image, that is, if a short back focal length is possible, then image quality equaling the best Distagon lenses can also be achieved at much lower effort by constructing an approximately symmetrical lens.

In 1946 the first patent for a new kind of symmetrical wide-angle lens was applied for by the Russian lens designer Mikhail Russinov. It looked as if two retrofocus lenses had been combined with the rear elements together and thus had a symmetrical arrangement of positive refractive powers close to the aperture, surrounded at the front and back by strongly negative meniscus lenses.

The Biogon

As of 1951, Ludwig Bertele carried this idea further and designed the legendary Biogon (figure 4) on behalf of Zeiss. At that time, it always had f/4.5 as its maximum aperture and was built with various focal lengths for a series of image formats: 21 mm for the 35 mm format, 38 mm for the 6×6 medium format, 45 mm for the 6×7 format, 53 mm for 6×9 and 75 mm for the 9×12 large format. There was also a 38 mm f/2.8 test prototype for the medium format and a Biogon 60 mm f/5.6 for photogrammetry developed for NASA.

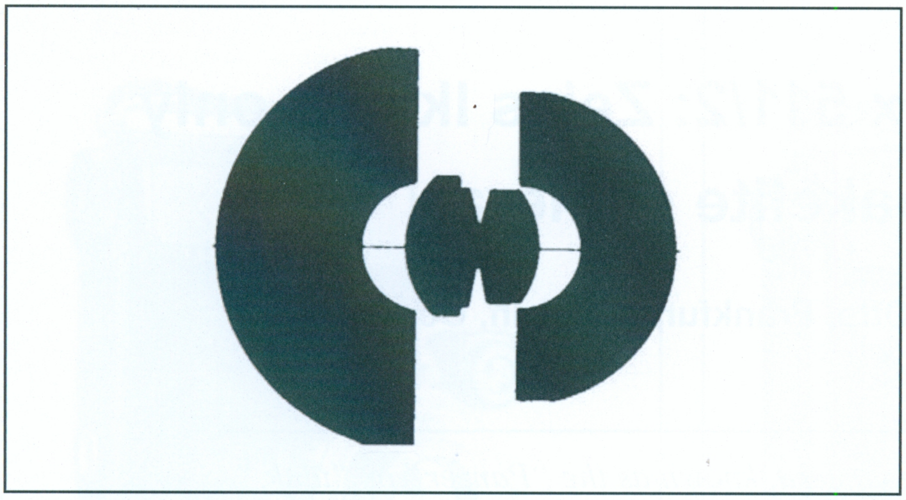
The cameras used with these lenses were rangefinder cameras such as the Contax from Zeiss Ikon or special housings in the system such as the Hasselblad Superwide or flat-bed cameras or special technical cameras.

The name "Biogon" was used for the first time in 1936 for a 35 mm f/2.8 lens for the Contax rangefinder camera, also designed by Ludwig Bertele. Its name also includes the final syllable "gon," referring to the angle. The syllable "bio" had a different meaning than today. Then it was often used to express the possibility of very dynamic photography and referred to quite different technical properties of the lens. We are already familiar with the "Biotar," with a high speed that made dynamic photography possible.

A super-wide with a 90° angle of view makes one think more of a camera that captures the subject with a perspective which, with appropriately high final magnification, gives the viewer the impression of being in the middle of the action.

The image quality of the Biogon was sensational in the 1950s, and its combination of a large field angle and nonetheless perfect definition up to the corners led to a real boom in wide-angle photography. Even today, these lenses offer credible performance. In addition to excellent contrast and definition properties, these lenses also offered perfect image geometry with almost no distortion. For the 21 mm f/4.5 Biogon, the maximum radial deviation was 40 µm. That is less than 0.1%, which is to say, insignificant compared with the 2 to 4% typical of retrofocus lenses with the same field angle.

Thus it is understandable that these lenses also continued to be used for a time in SLR cameras with a flipped-up mirror and attachable viewfinder. Convenience was deliberately sacrificed in the interest of image quality, because composing an image on the viewing screen is of course simpler and better



The f/8 15 mm Hologon first made in 1966. This lens for the 35 mm format had a back focus of only 4.5 mm Figure 7

than with a conventional viewfinder.

Wide angles and digital sensors

Even if the camera has no mirror or other "obstacles" in the image space, the design of a wide-angle lens can have great importance, particularly when the camera has a digital sensor – which it nearly always does today. This is attributable to a property of lenses that can be recognized from the exterior appearance of the lens without any knowledge of its internal design. With symmetric lenses, the entrance and exit pupils (figure 5) are of the same size, and this is the case for the old Biogon lenses as well as the Planar types for the rangefinder camera. Those Biogon types that are slightly modified for through-the-lens metering show slight asymmetry of the pupil ratio. This is also the case for Planar lenses for the SLR camera, which also tend slightly toward Distagon characteristics, because the refractive powers in the front part of the Gaussian type lens are somewhat smaller to achieve a sufficiently large back focal length.

If the entrance pupil is significantly smaller than the exit pupil, then you have a Distagon-type lens. For the telephotos with a shortened back focal length, such as a Sonnar, it is exactly the reverse.

A legend among camera lenses

In many of the wide-angle lenses described here the light beam reaches the image plane at a large oblique angle. The importance of this beam inclination is the reason for the impossibility of a comeback of some great legendary objectives. The Hologon from 1966 was an extreme wide-angle lens with a 110° angle of view, which was popular for its high definition up to the corners of the image and its complete absence of distortion. Thus it is no surprise that we are asked time and again when it will be reintroduced. Unfortunately, we must disappoint the fans of this lens, because a beam inclination of about 55° in the corner of the image is not compatible with digital sensors, at least not today.

The name of the lens is derived in part from the Greek word "holos," meaning "everything" or "complete." It was built from just three elements, two highly curved, very thick negative meniscus lenses on the outside and a positive lens in the middle (figure 6). One might decribe it as an inverse triplet.

However, the simple appearance of its design does not mean that it was easy to make. The high precision required for the shape of the lenses and their centering are extremely high. Because of the difficulties of production, the Hologon 16 mm for the Contax G, which came later, had five lenses, a technical "trick" to simplify manufacturing, with the cemented elements made of the same types of glass. ❐

Advantages of nearly symmetrical wide-angle lenses:

- Small size and low weight
- Very good, uniform definition despite moderately high effort required
- Usually excellent freedom from ghost images

Disadvantages of nearly symmetrical wide-angle lenses:

- Cannot be used with every camera
- Require specially matched sensors in digital cameras
- More sensitive to the change of optical parameters in the image space
- Greater natural fall-off of brightness toward the edge of the image

Advantages of asymmetric wide-angle lenses:

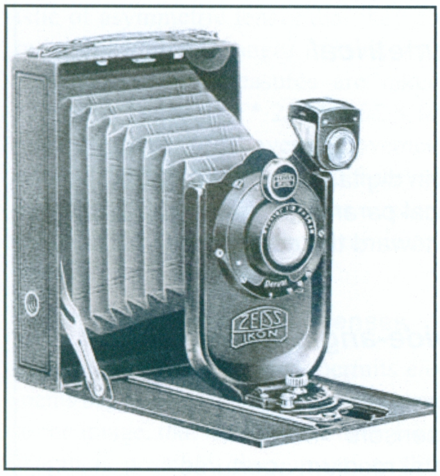
- Usable for all cameras in principle
- Favorable characteristics for digital sensors
- Very uniform image field illumination at medium apertures
- High maximum apertures possible

The Simplex 511/2: Zeiss Ikon's only bakelite camera

Bernd K. Otto, Frankfurt am Main, Germany

This inexpensive camera, known as the "Panzer" or "tank," was a short-lived experiment to use a novel material for its construction.

A customer asking for a "Simplex" in a photographic store in 1935 had to be a little more specific. When naming their new creation, the Zeiss Ikon company came up with nothing better than a name they had already used and that had even been employed frequently by the Heinrich Ernemann AG. Dr Rudolf Krügener had given this name to his first magazine camera, a kind of predecessor to the twin-lens reflexes, as early as 1888. Ernemann then brought out a really simple plate camera in 1917 with the model name "Simplex," whch was supposed to help sales in the difficult time shortly before the end of the First World War. This affordable camera was slightly improved in 1920, taken over by the newly created Zeiss Ikon AG after the fusion in 1926 and continued to be marketed. It was a camera designed for thinking schoolboys who enjoyed tinkering around and wanting to view the image on the screen. On the other hand, the camera of the same name presented in the spring of 1935 was a totally different construction from this Simplex 112/7, which in July 1937 was still listed in a special-offer sale. The in-house magazine Brücke for Zeiss Ikon dealers introduced the new Simplex with a hand-written memo as "good and cheap" in April 1935.



The Simplex 112/7, taken over from the Ernemann catalog, must have been the most inexpensive plate camera that one could buy.

Bakelite arrives

Anyone who studied the exhibits at the famous Leipzig trade fair could see that a new material was being introduced in many areas of technology. This synthetic resin was actually discovered in 1871 by the Nobel prize winner Adolf von Baeyer, although industrial implementation was of no interest to him.

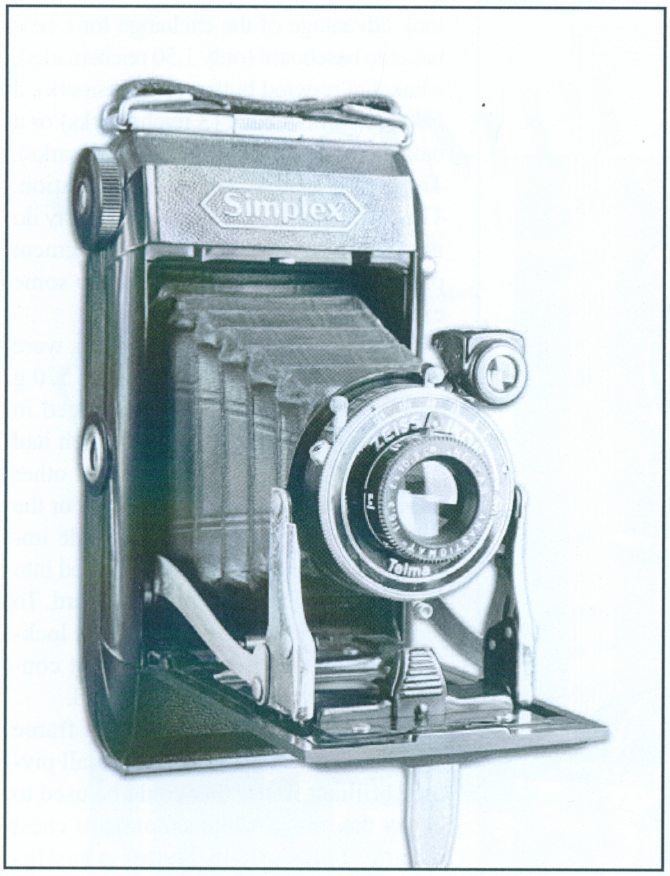
In 1907 the Belgian scientist Leo Hendrik Baekeland succeeded in correctly controlling the reaction of the individual substances and adding coloring and filling agents. This newly created material, bakelite, was soon used in the production of buttons, handles, automobile parts, insulation material and casings for various pieces of equipment but also in everyday products like containers for typewriter ribbons, cosmetic articles such as soap dishes and even in the manufacture of jewelry.

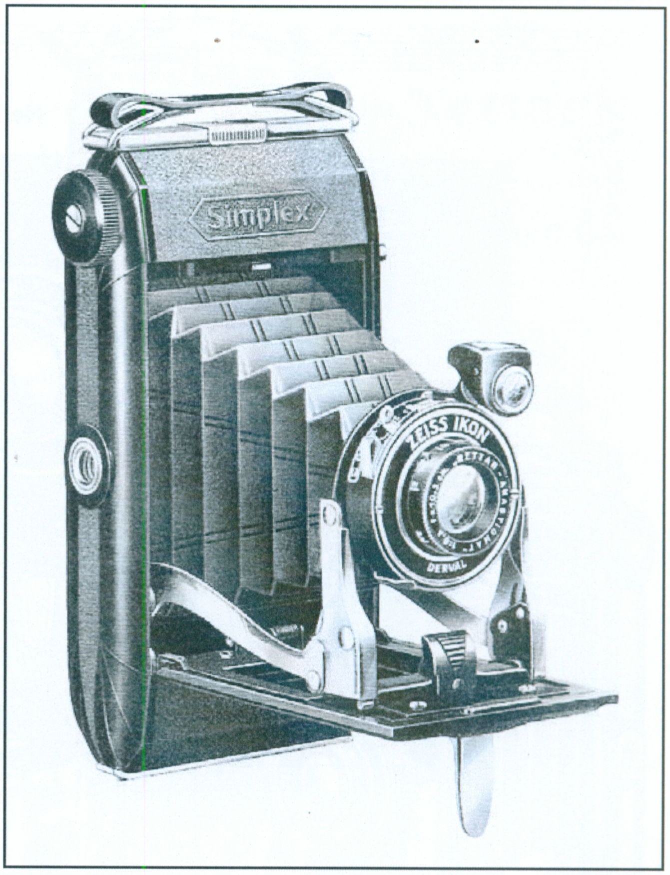
This article was first published in the III/2010 issue of PhotoDeal, in German. Trevor Richards made the translation on which this verion is based, and it appears here by permission of the author.

This plastic is a phenol resin that is created with the help of phenols and aldehydes. The material's hardness was of paramount importance; a permanent, attractive surface could be achieved without any covering or coating like leather or enamel varnish, and without any post-processing that would increase the cost. Even the color of the new product could be controlled. At BASF in Ludwigshafen they were able to produce the required synthetic resin in granulated form and then press it into shape under heat. Mass-produced articles could now be manufactured quickly and cheaply.

Cameras made of bakelite

It was of course inevitable that the photo industry should want to start production of bakelite cameras. Initially it was only small companies, which produced box cameras in bakelite. The Merten Broth-





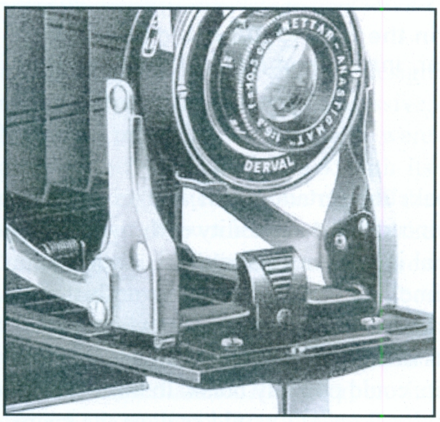
Simplex models with the Telma shutter (left) and the Derval shutter (right). The model with the Derval shutter did not feature the self-timer incorporated in the version with the Telma. One can assume that probably most customers decided on the slightly more expensive Telma version of a camera that was such good value in the first place.

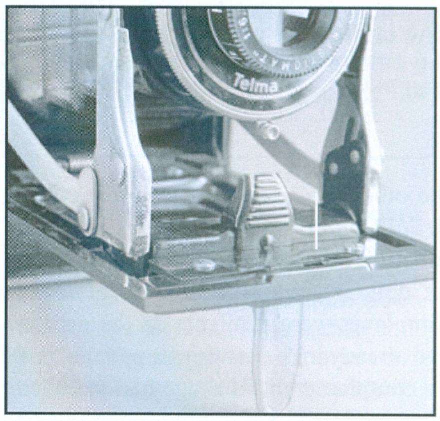
ers of Gummersbach (Merit Box, 1932–34) were followed by Ruberg & Renner of Hagen with their rigid-body camera, 1933–35, similar in construction to a box camera. Norisan Gerätebau of Nurenberg, better known today by its postwar product name of Genos, began producing bakelite cameras in 1933–35. Then came experiments with higher-quality cameras. In 1933 the Franz Kochmann Company of Dresden started producing the Forelle K using high-quality lenses such as Elmars, Tessars and Xenars. When the Kodak AG finally started manufacturing their Baby Brownie 4×4 cm, the Zeiss Ikon AG realized that the time had come to try out this new direction in camera production. This experiment was, as we now know, short-lived — less than two years.

The 6×9 Simplex roll-film camera (511/2), specially manufactured in bakelite, was an absolute outcast in the wide range of the mighty photographic company. These days it is extremely difficult to find one of these exotic cameras in perfect condition. The advertising department had a shop-window poster, printed immediately after the presentation, stating: “Simplex — the cheap modern Zeiss Ikon camera with the two-dot quick snap-shot setting — and a bakelite body.”

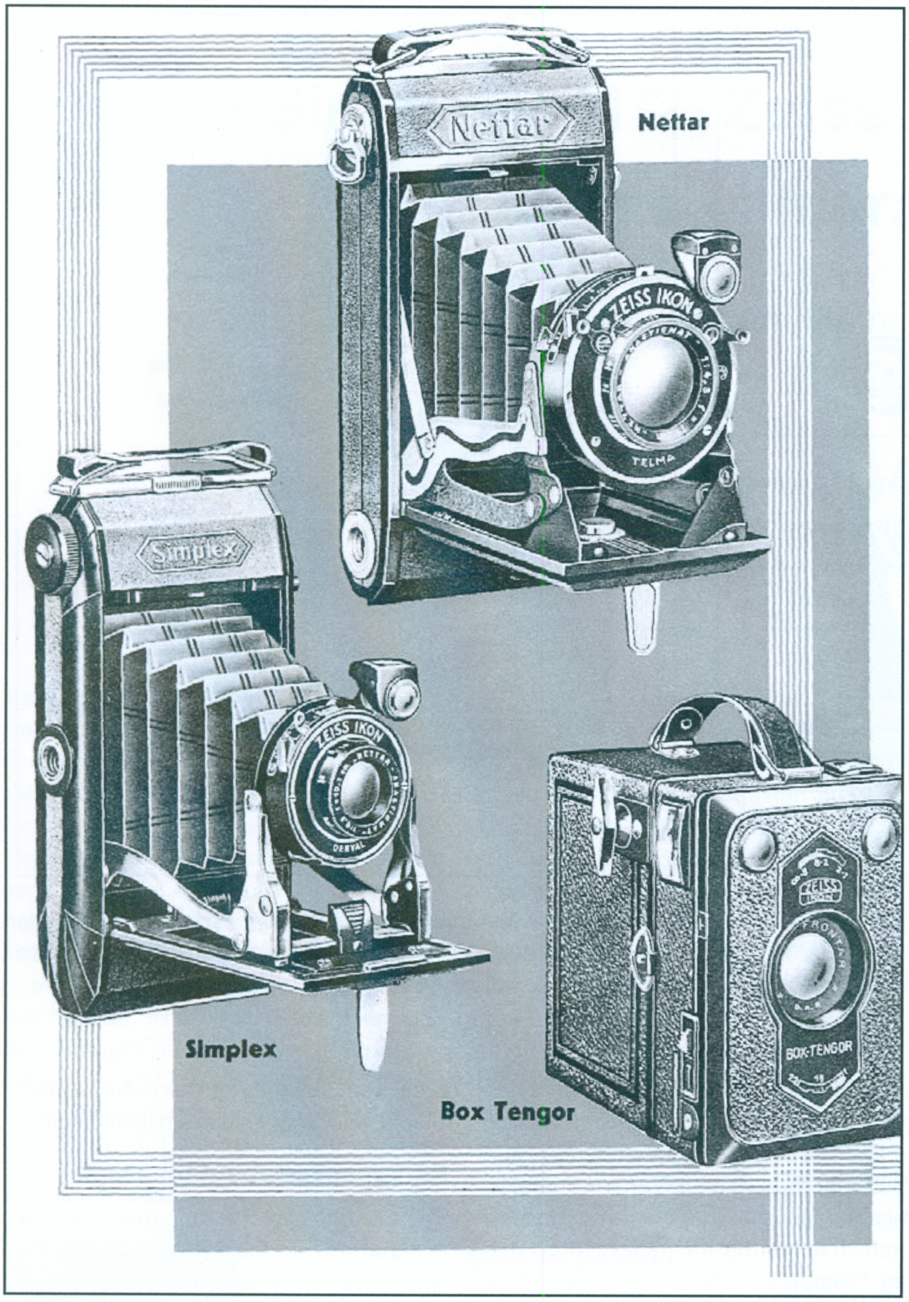
Nervousness about breakage

The roll-film camera made from this new material was, on the one hand resistant to heat, cold, damp and scratches, but on





The slight modification in the release key for the baseboard is not immediately obvious and certainly has nothing to do with the use of the two different shutters.



The choice for an inexpensive camera in the mid-1930s would be between the simple Tengor box camera, the Nettar, introduced in 1933, and the new Simplex 511/2.

the other hand sensitive to impact. The *Brücke* published a report on the new roll-film camera just three months after its delivery, when thousands of these Simplexes were available on the market and already in the hands of amateurs, and no complaints of breakage had yet been registered. And yet the more nervous of the business colleagues who were not completely sure about the resilience of bakelite certainly still had to be convinced of the suitability of the new material in camera construction. At the same time one had to admit that unfortunate coincidences could happen, where, for all its stability, a Simplex part made of bakelite could possibly break. In this case the Zeiss Ikon AG would replace the spare part at less than cost price. It is now impossible to tell whether any customers ever took advantage of the exchange for a new bakelite baseboard (only 1.50 reichsmarks), a bakelite re-wind button (1 reichsmark), a bakelite camera back (3 reichsmarks) or a bakelite camera front (5 reichsmarks). These prices even included installation. The few bakelite bodies on offer today do not show evidence of having replacement parts but rather are all damaged to some extent.

The measurements of the Simplex were 16.5 × 8.5 × 4 cm. With a mass of 570 g and those measurements it belonged in the class of the Nettar series, which had been developed since 1933. On the other hand the Simplex, unlike the Nettar or the Ikonta, did not go into action mode immediately. The struts had to be pulled into position along a rail on the baseboard. To close the camera one had to tilt the locking mechanism of the sturdy strut construction backwards with one hand.

The Simplex had a simple frame viewfinder, with an additional small pivoted brilliant finder that could be used to check the image while shooting at chest height. The built-in Nettar Anastigmat f /6.3 10.5 cm lens also reminds one of the Nettar series.

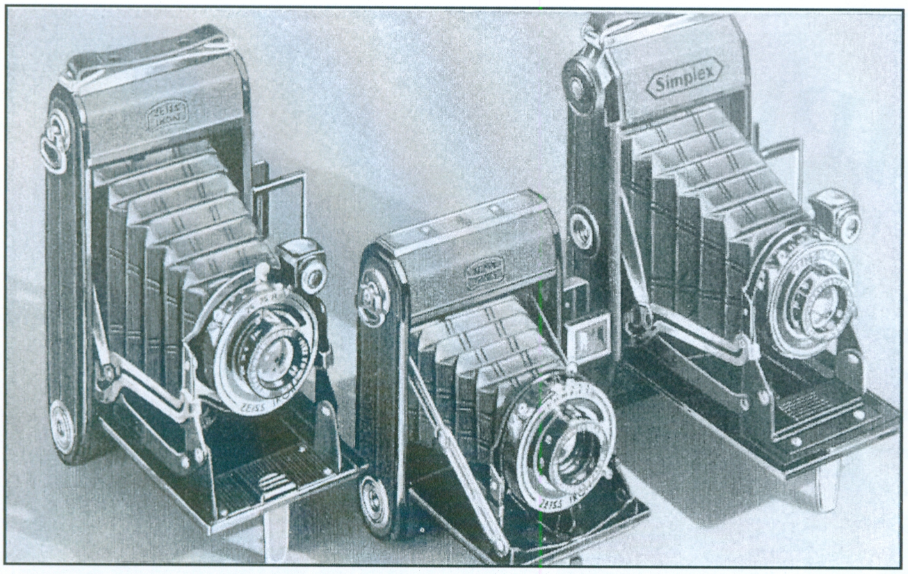
Zeiss Ikon offered the camera with a choice of two shutters. The basic version was with the well-known Derval (two blade) automatic shutter (B, T, 1/25, 1/50 and 1/100 s). The better version boasted the Telma shutter, developed in 1926.

The back of the Simplex shows a red window with a cover for use with pan film.

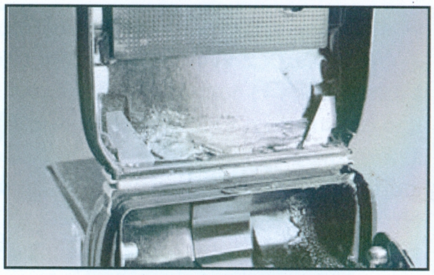
The latter was speeded to 1/125 s, and had a built-in self-timer with a delay period of 12 seconds. Both shutter combinations incorporated the Zeiss Ikon patented two-point focusing system. In order to have the Simplex at the ready for average shots, one would set one red dot on the distance scale at about 10 meters and another on the aperture scale at f/12.5. Zeiss Ikon then guaranteed that your snapshots would have a depth of focus from 4.6 meters to infinity.

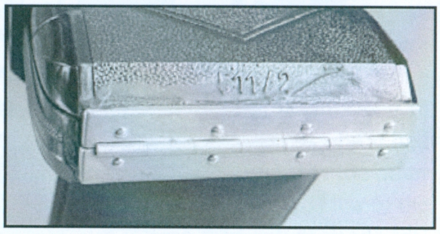
The brown, partially pitted surface of the bakelite camera reminds one of leather. The fashionable art-deco design of the rounded-off sides is impressive. Even the most awkward fingers were able to open the camera back with its novel locking system. If one carried the camera by its brown leather handle, the lock on the back of the camera was given additional protection. The serial number together with the appropriate serial letters were supposed to be concealed on the underside of the handle. However, on the camera at our disposal no number is discernible anywhere on the body. The Simplex used the film size B II 8 (now

Three examples of the high standard of Zeiss Ikon design in the mid-1930s. Both the new Nettar from 1933 and the Simplex introduced in 1935 show elements of the Art Deco style in their construction. The advertising department needed statements with precise, short texts on the red dot, which, forms an exclamation point with the slanting line in the Simplex advertisement.



The text with this illustration in a publication of February 1937 suggests that Zeiss Ikon substituted the spring mechanism from the Bob for that of the Simplex shortly before the removal of this camera from the range of products.





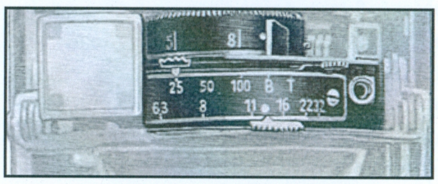
Although known as the "Panzer," a play on the German word for "tank" and "shell," the Simplex was liable to breakage. The back and body of this example have obviously both been repaired.

known as 120), the standard format still in use today, which provides eight shots of 6 × 9 cm. A film window cover on the back of the camera protected it from unwanted light leakage and enabled the use of the new panchromatic film. The name "Simplex," the order number 511/2, and the "Zeiss Ikon" logo were moulded into the surface of the bakelite.

An attractive leather batik case was part of the ensemble. One could also purchase a yellow filter and two supplementary lenses for close-up shots at 1 meter or 0.5 meter. In the camera's first year on the market the price was 30 reichsmarks for the Derval model and 35 reichsmarks for the Telma version.

As early as October 1936 in their publication *Immer Sprungbereit* ["Ready for Action"] (C755) the Zeiss Ikon AG presented the Bob 510/2 as the future replacement for the Simplex. This new instrument, from then on the cheapest self-erecting roll film camera, also incorporated the "patent snapshot," meaning the two-dot setting that was indeed only available on Zeiss Ikon cameras. By using the new Automat or Automat S shutter and the slightly slower Nettar f/7.7 lens the company was able to reduce the price to 24 or 28.50 reichsmarks. The Simplex was then offered (from July 1936) at the reduced price of 27 or 31.50 reichsmarks to help shift the remaining stock. An attentive reader of the publication C 780 of February 1937 would notice that the previously described, slightly different bakelite locking devices for the Derval and Telma systems had been omitted and the novel Simplex front standard had been altered. The technicians fitted the entire Bob spring mechanism, which did not need any particular locking device, onto the bakelite body. The Simplex in its original form was shown for the last time in the May 1938 brochure (C 732/825), despite the fact that at that point the camera was no longer available. In its place the customer could order the Bob. This roll-film camera also disappeared from the stores in February 1939 and was no longer listed in the publication C 875. ❒

Instruction books for two cameras with the same name but quite different designs.



The red dots for the so-called snapshot setting, one on the distance scale (beyond 8 m), the other with the aperture numbers. between f/11 and f/16.

Zeiss in Dresden

Michael Buckland,
University of California, Berkeley

Dresden from the Rathaus tower, 1910

Much has been written about Zeiss in Jena, but the larger city to the east has a claim to the history too — especially after the Zeiss Ikon merger.

Carl Zeiss famously set up his optical workshop in Jena in Thuringia in 1846. With effective management and collaboration with the local university it became a large firm of international importance that continues today a century and a half later. The names Zeiss and Jena are indelibly paired. Less widely understood is that for an extended period there was a comparable relationship between Zeiss and the much larger and more important city of Dresden in Saxony. Jena, a small university town, had fewer than 27,000 inhabitants in 1905; Dresden had half a million. Zeiss Ikon became the largest firm in one of Germany's largest cities and it, too, collaborated closely with its local university. In the past several years, the Zeiss presence in Dresden has been illuminated by a series of publications that update and greatly extend the rather limited coverage of Dresden relative to Jena in works on Zeiss corporate history. Here we provide a brief introduction to this history and these publications.

By the end of the nineteenth century Dresden, the capital of Saxony, was one of the largest and most important cities in Germany. It was well-established as the center of the German photochemical industry and the seat of several camera manufacturers, including Europe's largest, Hüttig. Hermann Krone, Germany's leading photographer, lived and taught in Dresden.

Formation of Ica

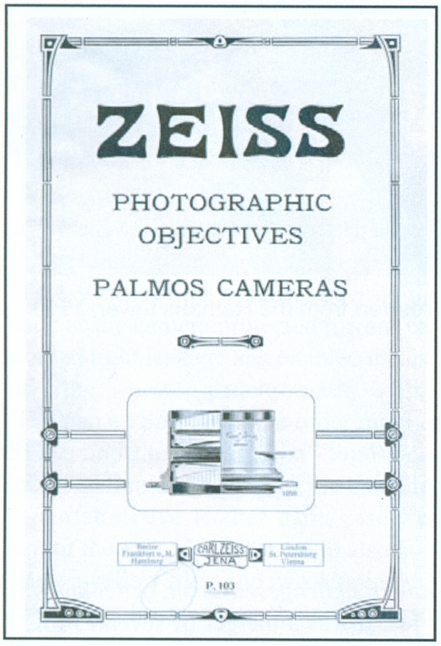
At the beginning of the twentieth century the photographic products industry was going through a rapid consolidation as small independent workshops were absorbed into larger firms better equipped for more advanced technology and for large-scale production. A major development was the creation in 1909 of a new firm in Dresden named the *Internationale Camera Aktiengesellschaft*, better known as Ica. It was a merger of several firms: Hüttig, Wünsche, Krügener (Frankfurt am Main), Palmos (Carl Zeiss's camera division in Jena), and, later, Zulauf (Zurich). The merger was coordinated by Zeiss executive Rudolf C. Straubel and the new firm was controlled by Zeiss from Jena. A tough self-taught manager, Guido Mengel, was put in charge. (Herbert Blumtritt's 2000 work provides a convenient guide to the histories of the many photographic firms in Dresden; see the bibliography at the end of this article.)

Dresden Technical University

The early twentieth century was a period of intense research and development into sensitometry, optics, and other aspects of photography, which was rapidly moving from a craft to a science. Accordingly, the photographic firms in Dresden wanted the Dresden Technical University to pay

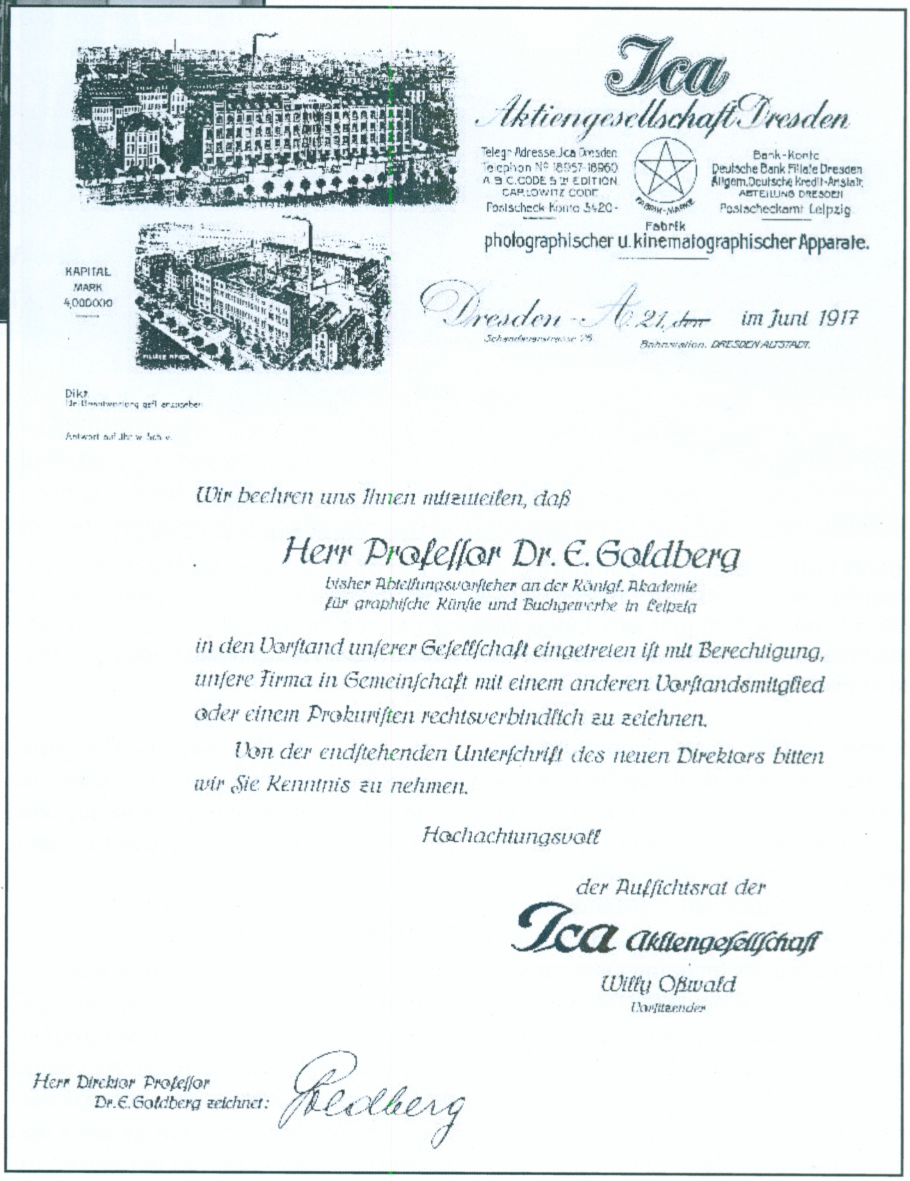
more attention to the science and technology of photography. The outcome, proposed by Heinrich Ernemann, was the establishment in 1908 of a new Institute of Scientific Photography (*Wissenschaftlich-Photographisches Institut*), the first of its kind.

Local photographic firms, notably Ernemann, Ica, and later Zeiss Ikon, provided economic, political, and practical support for the Institute. Thirteen firms contributed 5,000 Marks to equip a lab and 3,000 Marks recurrently. The dynamics of the relationship between the



"ICA" was originally formed in 1909 by a merger of the four other companies identified by the illustrations on this page.

◄ **Emanuel Goldberg**



Ica
Aktiengesellschaft Dresden

Telegr. Adresse: Ica Dresden
Telephon Nº 18957-18960
A. B. C. CODE 5th EDITION
CARLOWITZ CODE
Postscheck Konto 5420-

Fabrik-Marke

Bank-Konto
Deutsche Bank Filiale Dresden
Allgem. Deutsche Kredit-Anstalt,
Abteilung Dresden
Postscheckamt Leipzig

Fabrik
photographischer u. kinematographischer Apparate.

KAPITAL
MARK
4,000000

Dresden - A. 21, den im Juni 1917
Bahnstation: DRESDEN ALTSTADT.

Dikt.
Bei Beantwortung gefl. anzugeben

Antwort auf Ihr w. Sch. v.

Wir beehren uns Ihnen mitzuteilen, daß

Herr Professor Dr. E. Goldberg
bisher Abteilungsvorsteher an der Königl. Akademie
für graphische Künste und Buchgewerbe in Leipzig

in den Vorstand unserer Gesellschaft eingetreten ist mit Berechtigung, unsere Firma in Gemeinschaft mit einem anderen Vorstandsmitglied oder einem Prokuristen rechtsverbindlich zu zeichnen.

Von der endstehenden Unterschrift des neuen Direktors bitten wir Sie Kenntnis zu nehmen.

Hochachtungsvoll

der Aufsichtsrat der
Ica Aktiengesellschaft
Willy Oßwald
Vorsitzender

Herr Direktor Professor
Dr. E. Goldberg zeichnet: Goldberg

The formal announcement of Goldberg's appointment at Ica. ►

Robert Luther, Emanuel Goldberg and an unidentified officer at the Western Front, probably near Lens in 1915. Goldberg is in civilian clothes near center; Luther is on his right (our left). Luther had volunteered for a military observation balloon battalion. Goldberg visited to offer technical advice on aerial photography, and this led to his being hired by Zeiss.

Institute and the photographic industry has been examined in depth by Klaus Mauersberger, who is curator of old instruments ("*Kustodie*") and teaches the History of Technology at the Dresden Technical University (Mauersberger 1998, 2008).

The Institute's founding Director was Robert Luther, formerly Subdirector of Wilhelm Ostwald's famous institute for physical chemistry at Leipzig University. Luther was a theorist who also believed in addressing practical problems and he required all the students in the Institute to have technical and well as academic skills. The Institute attracted students from all over the world, including the American photographer Imogene Cunningham.

Emanuel Goldberg

In 1917, Zeiss, continuing its practice of recruiting academics, appointed Emanuel Goldberg, a professor of photography and reprographics at the Royal Academy of Graphic Arts and Bookcraft (*Königliche Akademie für graphische Künste und Buchgewerbe*) in Leipzig, to assist Mengel at Ica. He had studied physical chemistry in Leipzig under Ostwald and Luther and been an assistant to Adolf Miethe in the Photochemistry Laboratory at the Technical University in Berlin. Goldberg had come to Zeiss's attention on the western front during the First World War in 1915, where he had gone to help Luther to improve aerial photography of enemy trenches. Goldberg's efforts attracted the attention of Ernst Wandersleb of the Carl Zeiss Jena optical department. A couple of years later, Zeiss became interested in a versatile lens testing device developed by Goldberg and retained him as a consultant. Then in 1917 Zeiss employed him to work full-time at Ica.

Goldberg would have been already known in Dresden because of his status as a professor of photography in Leipzig, his numerous publications and inventions, and a widely praised educational exhibit at Dresden's 1909 International Photographic Exhibition. The plan was for Goldberg to develop new military products, but this was soon forbidden under the restrictive terms of the Treaty of Versailles. So, instead, Goldberg focused on modernizing Ica products and on the design of amateur movie equipment, including the compact, spring-driven Ica Kinamo which became a camera of choice among makers of technical, avant-garde, and documentary films (Buckland 2008, 2009).

Luther and Goldberg

Luther and Goldberg were close personal friends and had much in common. They had both grown up in Moscow and Goldberg had been one of Luther's students in Leipzig. They shared a research interest in sensitometry, but they also had broader interests and they both believed fervently in the need for academic research to address the practical needs of industry. When Goldberg moved to Dresden in 1917, Luther arranged for him to be appointed as a part-time instructor in the Institute where for many years he taught classes on cinematography, sound movies, reprographics, and the application of photographic techniques in science and technology. Goldberg evidently enjoyed teaching and in 1927 took students on a skiing trip in Austria where they made a light-hearted, romantic movie: *Ein Sprung . . . Ein Traum: A Kinamogeschichte aus dem Studentenleben* (A Jump ... A Dream: A Kinamo Story of Student Life). Long thought lost, a copy was found in 2008 by film historian Ralf Forster and has been restored by the German Federal Film Archive.

After Goldberg left Dresden in 1933 his part-time teaching was continued by Zeiss Ikon manager Hermann Joachim and his research on extreme-reduction microfilm was continued by Hellmut Frieser in the Institute, where during the Second War microdot cameras were made for spies under a university–intelligence agency collaboration (Buckland 2006).

Zeiss Ikon

As is well-known, in 1926 the Carl Zeiss Stiftung arranged a merger of Ica with three other leading firms (Contessa-Nettel, Goerz, and Ernemann) to form Zeiss Ikon, the largest camera firm in the world. R. C. Straubel played in leading role in forming creating Zeiss Ikon, just as he had with Ica.

Dresden, the university, and Zeiss Ikon all gained visibility in 1931 when they collaborated to host the International Congress of Photography, held in Germany for the first time. It was organized jointly by Goldberg, Luther, and John Eggert (Agfa) and was noteworthy for the joint presentation by Luther and Goldberg of proposals that became the DIN film speed system.

The Hellerberg Camp

When Hitler came to power the restrictions of the Treaty of Versailles on the manufacture of military equipment were disregarded, a very significant development for Zeiss. The Nazi purge of Jewish influences removed the top Zeiss leader in both Jena and Dresden. In Jena, Straubel, now the head of Zeiss, was given an ultimatum by his colleagues to choose between his job and his Jewish wife and chose his wife. He was also stripped of his university appointment, but he was allowed to continue to chair Zeiss Ikon's supervisory board. In Dresden Goldberg was kidnapped from the Zeiss Ikon offices and became a refugee, going first to France, then to Palestine.

Like other large firms, Zeiss used forced labor to ease the acute labor shortage in Germany. Heinz Küppenbender, who took charge in Jena, advocated the deportation of workers from German-occupied territories, especially women from Eastern Europe, who were conveniently exempt from the protection of German labor welfare laws.

In Dresden, Zeiss Ikon also made extensive used of forced labor and in November 1942 the company facilitated the round-up of the remaining Jews in Dresden by re-purposing and operating one of its storage warehouses as the Hellerberg camp in which Jews were forced to live and to pay rent to Zeiss Ikon before being sent on to concentration camps. The round-up was filmed and the film has been made available. (For the Hellerberg camp see Weinmann 1990; Busse & Krause, 1989, 39–46; Haase, Jersch-Wenzel, & Simon 1998, 124; Hirsch 2002).

World War II

The arms build-up greatly benefited Fernseh AG, Zeiss Ikon's joint venture with Baird, Bosch, and Loewe, which developed minute television cameras and transmitters as attachments to allow precise steering of flying bombs. Zeiss Ikon, however, abandoned its investment in electronic imaging and sold its interest in Fernseh AG to Bosch in 1939 just as it was approaching profitability (Buckland 2006).

The allied bombing of Dresden of February 13-14, 1945, destroyed much of the main Zeiss Ikon works at Schandauerstraße 76 and all the corporate records there. The Ernemann works, however, although nearer the city center, suffered much lighter damage and the Ernemann corporate records survive in the State Archives and include copies of some of the Zeiss Ikon documents destroyed at Schandauerstraße 76.

The Ernemann building, with its distinctive tower, now houses an excellent technology museum, the Technische Sammlungen, which displays a remarkable collection of some 2,000 Zeiss-related cameras. The museum organized a noteworthy conference on the history of Zeiss Ikon in 2001 (75 Jahre, 2002).

After 1945

For Dresden the war ended with the arrival of the Soviet army in May 1945 and the struggle to revive Zeiss Ikon began. But along with the wartime devastation, there were many difficulties including the extensive expropriation of machinery by the Soviets as war reparations, the emergence of a rival Zeiss Ikon in West Germany, and eventually the loss of the right to use the trade name Zeiss.

In 1946 Zeiss Ikon AG was reconstituted as VEB Zeiss Ikon, in 1958 renamed VEB Kinowerke, then merged with other firms to become VEB Kamera- und Kinowerke Dresden in 1959 and, in 1964, VEB Pentacon using the syllables in *Pen-ta*-Prisma and *Con*-tax. In 1968 VEB Pentacon combined with Ihagee and other firms to form Kombinat VEB Pentacon. As with the mergers of 1909 and 1926, the rationalizing of multiple work units, scattered locations, and numerous different products was a difficult challenge. The primary camera trade mark was Praktica, but Exakta, Pentacon, Practina, and others were also used. In 1985 VEB Pentacon was associated with VEB Carl Zeiss Jena but went out of business at the end of 1990.

Fortunately all these changes and successive product development are skilfully and authoritatively presented in Gerd Jehmlich's splendidly detailed and beautifully illustrated history of the photographic industry in Dresden since 1945 : *Der VEB Pentacon Dresden: Geschichte der Dresdner Kamera- and Kinoindustrie nach 1945* (Sandstein, 2009). Jehmlich was well qualified to write it, having been the director of research and development at Pentacon for many years and then involved in developing the extensive collections of photographic equipment of the Technische Sammlungen museum, which provide eloquent testimony of Zeiss in Dresden. ❐

A selected bibliography of sources for Zeiss in Dresden appears on the following page.

Larry Gubas provided the illustrations on p. 20 and the portrait of Goldberg on p.21. The letter on p.21 and the photograph on p. 22 are from the author.

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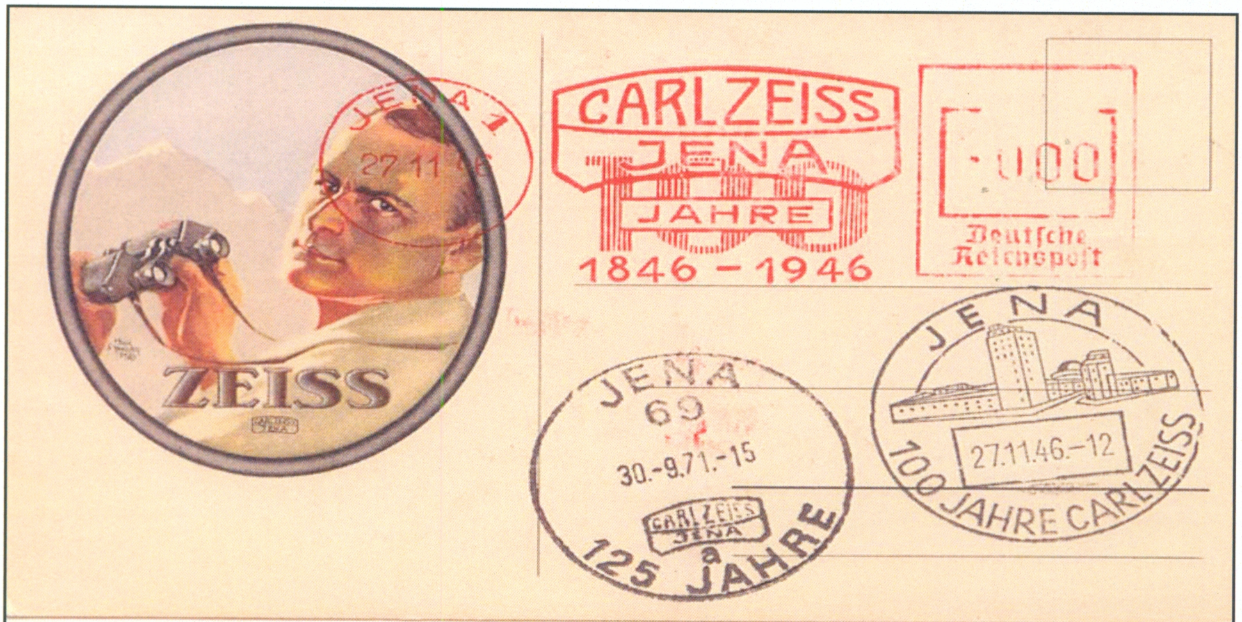
This array of Zeiss wide-angle lenses was assembled by the Carl Zeiss Lens Division, to whom we are indebted for permission to publish it. It includes many of the models discussed by Hubert Nasse in his article starting on page 9.

1. Distagon T* 2.8/15 ZM for 35 mm rangefinder camera
2. Distagon 3.5/15 for CONTAX 35 mm-SLR
3. Distagon 2.8/25 for Contarex 35 mm-SLR
4. Distagon 5.6/60 for Hasselblad 1000 F 6 x 6
5. Distagon 4/50 for Hasselblad 500 C 6 x 6
6. F-Distagon 3.5/30 Fisheye lens for Hasselblad V-System
7. Distagon 4/40 IF for Hasselblad V-System 6 x 6
8. Distagon 4/40 for Hasselblad 500 C 6 x 6
9. F-Distagon 3.5/24 Fisheye with circular image for Hasselblad
10. Distagon 2.8/21 for CONTAX 35 mm SLR
11. Distagon T* 2.8/21 ZE for Canon EF-mount
12. Distagon T* 1.4/35 ZF.2 for Nikon F-mount
13. PC-Distagon 2.8/35 Shift-lens, automatic diaphragm (CONTAX)
14. PC-Distagon 4/18 Shift-lens for 35 mm motion picture camera
15. Hologon 8/16 for CONTAX-G electronic rangefinder camera
16. Biogon 4.5/21 for Contarex 35 mm-SLR
17. Biogon 2.8/21 for CONTAX-G electronic rangefinder camera
18. Biogon T* 2.8/21 ZM for 35 mm rangefinder camera
19. Biogon 4.5/38 on Hasselblad Superwide 6 x 6
20. Biogon 4.5/38 in NASA-version for space photography
21. Biogon 2.8/38 Prototype of 38 mm Biogon with higher speed
22. S-Biogon 5.6/40 for close distance copy applications
23. Biogon 4.5/76 9-lens version for 114x114 mm aerial photo
24. Hologon 8/110 for large format 13x18 cm
25. Distagon 12/T1.3 for 35 mm motion picture camera, PL-mount
26. Distagon 8/T1.3 for 16 mm motion picture camera, PL-mount
27. Distagon 2/10 for 35 mm motion picture camera, PL-mount
28. Distagon 2.8/8R for 35 mm motion picture camera, 130° field
29. Distagon 1.7/3.9 for 2/3“ 3-chip camera
30. Distagon 1.5/70 for 2/3“ 3-chip camera (not a wide-angle!)
31. P-Distagon 3.5/75 Projection lens for 6 x 6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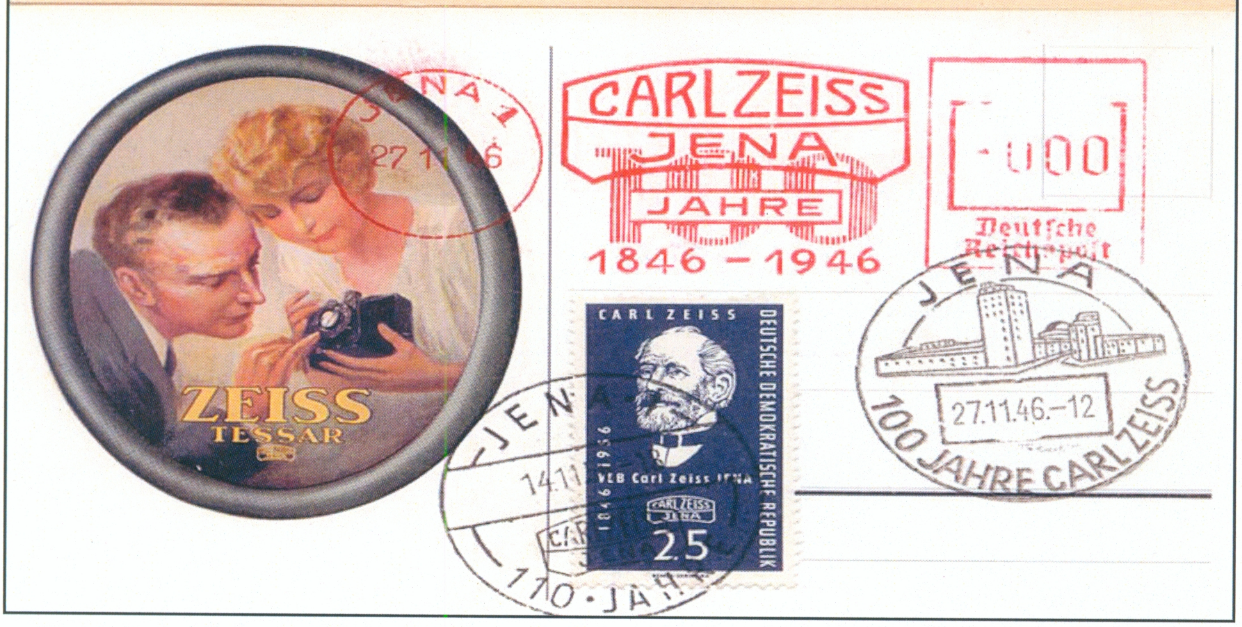
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