# ZEISS HISTORICA

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



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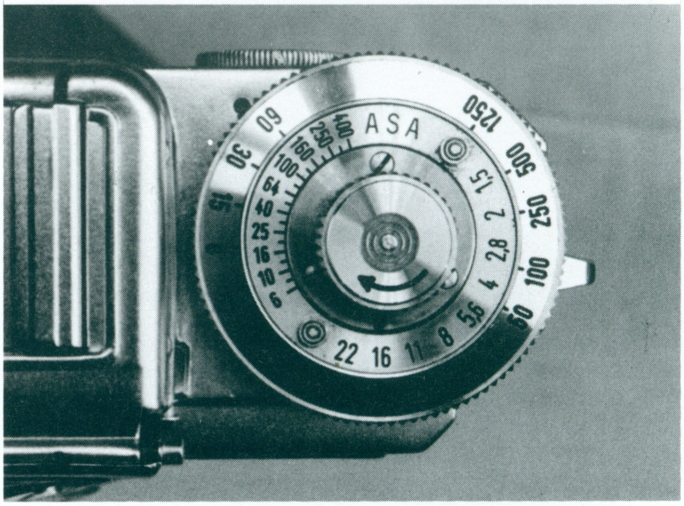
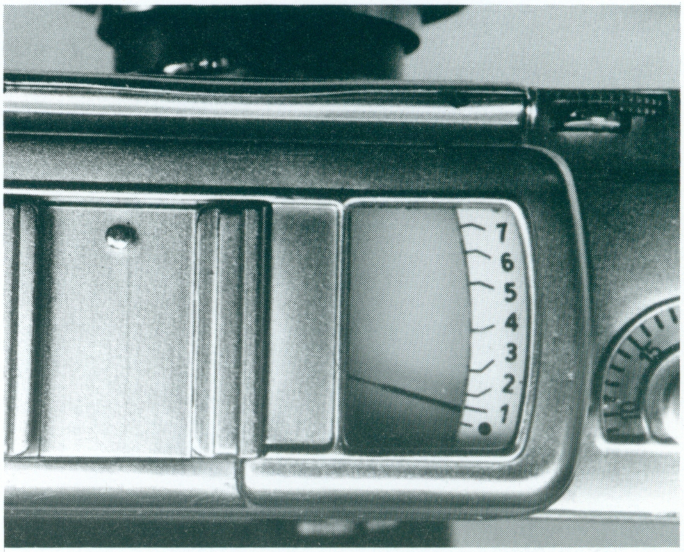



*Dial of hybrid Contax is marked in ASA speeds. Shutter speeds at right (1/2 to 1/1250) are in black, those at left (1 sec. to 1/60) are in red. Meter numbers on side of dial (invisible here) are also dual-range: 1 to 8 in black, 2 to 7 in green.*




*Meter scale of the hybrid Contax.*


# ON THE COVERS

*FRONT COVER. The hybrid Contax discussed at right.*
*BACK COVER. Ad from the January 1937 issue of the British magazine "Photography". Zeiss Ikon was clearly well aware of the proliferation of their 35 mm. cameras, as discussed in this issue.*

# ILLUSTRATION SOURCES

*Front cover and this page, the Editor. • "Four Horsemen" photos from Dr. Robert F. Smith • Photo of original Stativ VII Microscope and brochure describing Stativ VII replica, Nick Grossman • Photos for "Leica/Contax" article are of original pre-war brochure illustrations, by Robert Helm. • "Prime Quality" and "How Old Is Your Zeiss Product?" photos, Nick Grossman.*

# A CONTAX III FACTORY HYBRID

Contax fanciers may well do a doubletake at the Contax III shown on the cover. It is indeed a III, serial number B50541, with the III's typical large rangefinder window over the self-timer, and lack of synchronization. But what of that meter knob and meter cover?

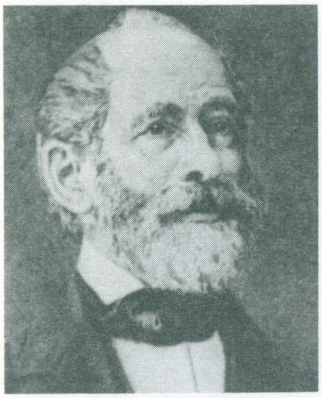
The contradiction was resolved by the previous owner (camera is now the Editor's). It seems that the camera was purchased in New York in about 1939, and returned to Zeiss in Stuttgart around 1948 for repairs. It was there that the substitute parts were installed.

Member Charles Barringer makes several interesting comments on this camera. He suggests that the really interesting difference between this and a IIIa is in the meter assembly itself. Its 1 to 7 series and dot reflect both parent and offspring. The III shared the one-way needle movement of the IIa, but was differently calibrated, while the IIIa has its needle swinging up or down from a zero point. The holes in the meter cover suggest a two-range meter, which is born out by the markings on the knob (see caption above.)

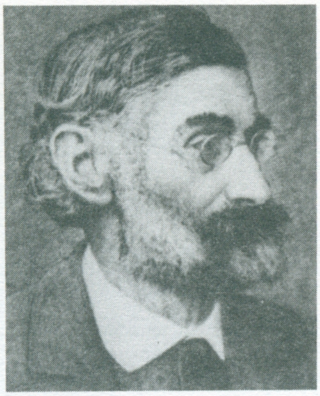
He further suggests that this may containe parts of a prototype IIIa-metered III, since the IIa was not introduced until the 1950 Photokina, and the IIIa, according to Kuc's "Contax History", appeared in 1951 for the 25th Anniversary of Zeiss Ikon AG.

# THE FOUR HORSEMEN OF MICROSCOPY

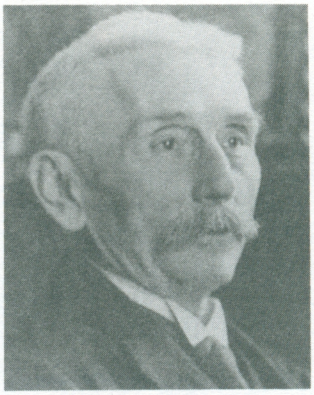
*Dr. Robert F. Smith, Ithaca, N.Y.*



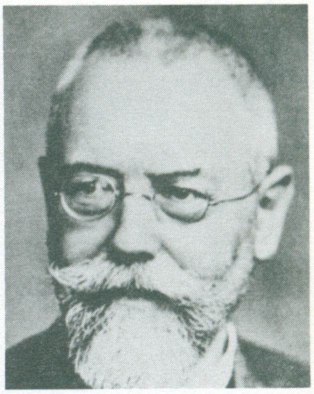
*Carl Zeiss (1816-1888)*



*Ernst Abbe (1840-1905)*



*Otto Schott (1851-1935)*



*August Koehler (1866-1948)*

The story of the development of the microscope as we know it today reads like an exciting novel. Too few people engaged in the use of the microscope are aware of the long and tortuous route to its present state-of-the-art perfection. This column is in the form of a tribute to the men shown here, whom I refer to as the "Four Horsemen of Microscopy": Carl Zeiss (1816-1888), Ernst Abbe (1840-1905), Otto Schott (1851-1935) and August Koehler (1866-1948).

## *BEGINS 120 YEARS AGO*

The story starts about 120 years ago when Carl Zeiss, a university mechanic, and Ernst Abbe, who at that time was a young lecturer in physics and mathematics, began their collaboration. At that time, microscope objectives were built simply by trial and error. The individual worker making these objectives tried to obtain the ultimate quality lens, using his experience and skills to grind, select, assemble and adjust their spacing to produce the best quality image.

A Zeiss workshop foreman, A. Loeber, with great experience in the test glass method combined it with a method developed by Abbe for measuring exactly the focal lengths of single lenses and complete systems, resulting in the production of six achromats manufactured by Zeiss starting in 1861.

In 1869, the failure of Loeber to produce a satisfactory water immersion lens like those made by E. Hartnack of Berlin prompted Zeiss to approach Abbe with a request for optical calculations of microscope objectives. Abbe promptly went to work on the problem. However, in order to obtain reliable data about refraction and dispersion of available glasses and other materials, he had to first build a refractometer; this instrument still bears his name today.

Due to underestimating the scope of the computations required, his first attempt resulted in failure. In 1880, this failure resulted in his asking himself two questions: First, why does a large aperture produce more perfect images and finer detail than a small one, when in practice the incident cone of rays may only fill a small aperture while the remaining apparently unused portion remains as a dark space? Second, by what means is the use of this dark space made possible?

## *ORIGINAL CONCEPT*

Abbe's original concept was that geometrical optics would be sufficient for the calculation of microscope objectives. This resulted in his first computations using relatively small apertures in order to obtain better correction than objectives previously produced by Carl Zeiss. But, in spite of repeated calculations and a better geometrical recombination of the beam, the images of fine structures produced by these objectives were more blurred and had less resolution than those produced by the older, less corrected systems with a wider aperture angle. This failure made him realize that he must find a physical explanation of the formation of the microscope image.

He started with the investigation of the "dark space" and the reason for the importance of a higher objective aperture, neither of which could be explained by geometric optics. After countless experiments, he came to the conclusion that the secret lay in diffraction at the object structures, and therefore could only be explained in terms of the wave nature of light.

To confirm his concept, he devised a whole system of experiments that remain to this day the most beautiful and impressive example of the physical experimenter's art. These experiments make it possible for the non-expert to understand Abbe's diffraction theory of image formation in the microscope. Some of these experiments have been duplicated here.

## *FAITHFUL REPRODUCTION*

Figure 1 is the Zeiss Microscope VII. This is a reproduction of the original instrument made to the exact dimensions of the original; even the warm golden luster of the brass was duplicated by searching out age-old recipes. Robert Koch discovered the tubercle bacillus using this microscope, and it was with such an instrument that Abbe conducted his famous diffraction experiments using a kerosene lamp as a light source.

My wife, Jacquiline, presented me with one of these instruments as a 50th wedding anniversary present. Using the diffraction apparatus supplied with the microscope, I duplicated some of Abbe's experiments. The instrument is shown against a background of Abbe's calculations along with the diffraction plate on the stage and two objectives and the aperture sliders.

To make the photographs to illustrate Abbe's experiments and use the same vintage instrument, it was necessary to mount the camera on a copystand upright and place the microscope under it with a cardboard-and-tape light-trap connector in between. The ocular was replaced with a phase centering telescope to enlarge the diffraction pattern on the film. When the secondary image of the grids was photographed, the normal ocular replaced the phase

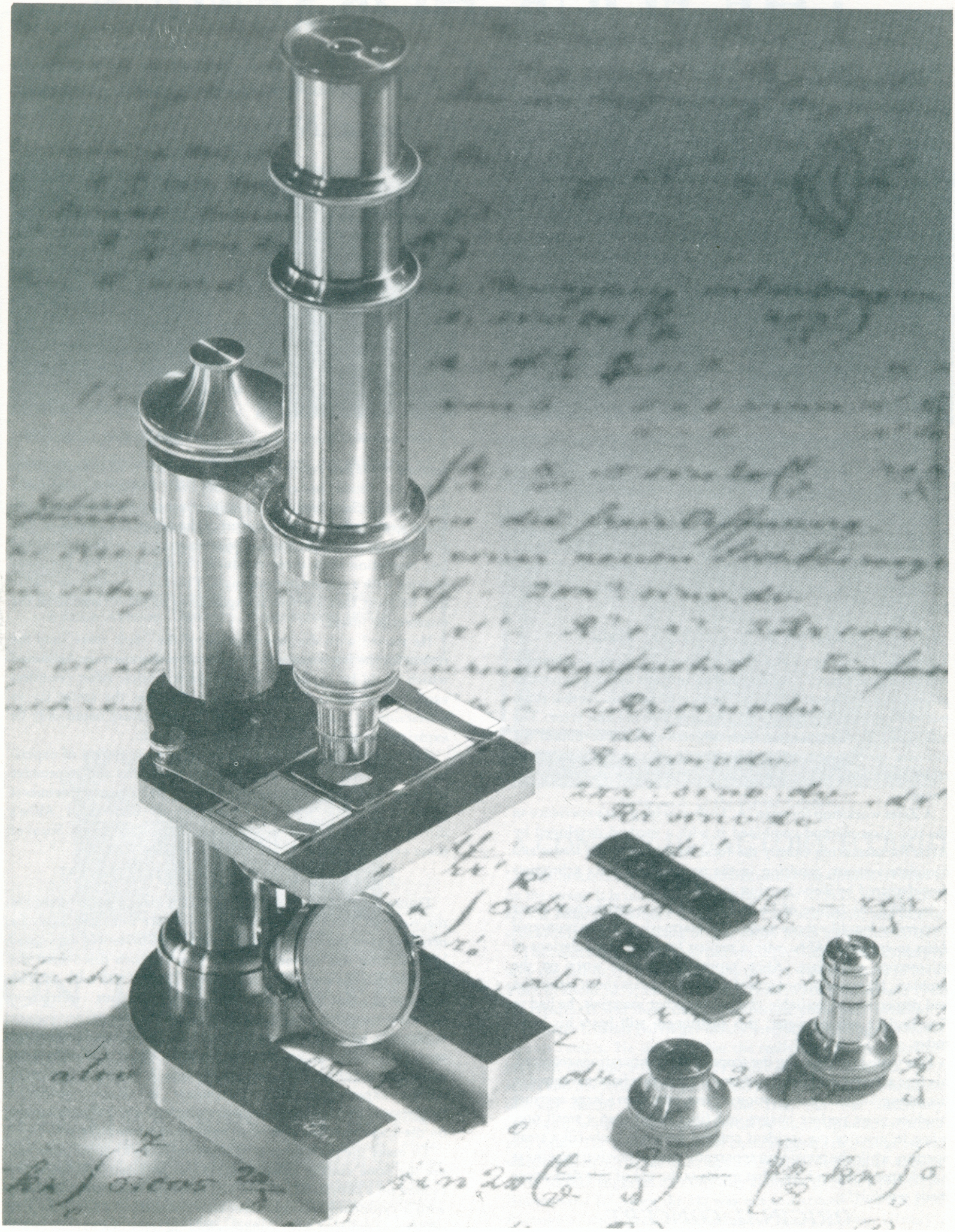
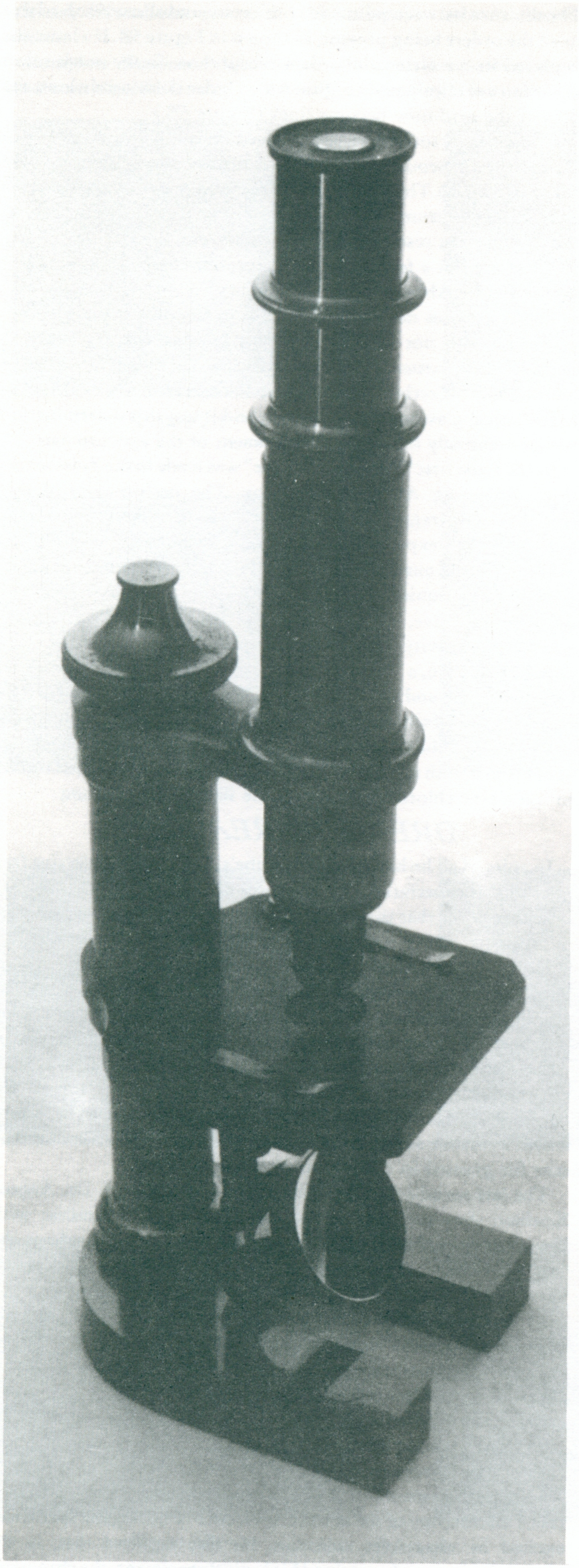


*Figure 1. Factory replica of the Stativ VII microscope.*

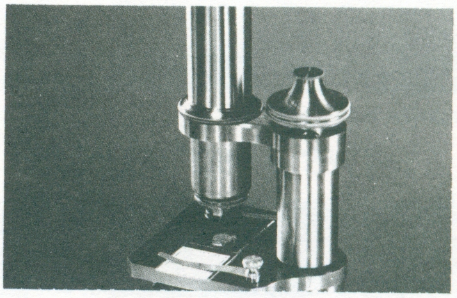


*The original Stativ VII.*

## A complete microscope from the 1880's.

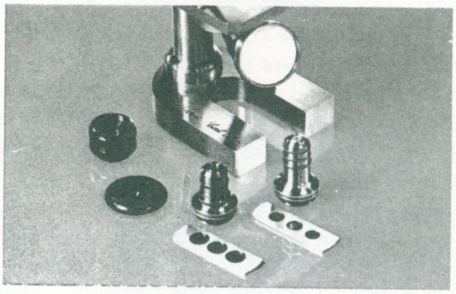
The Stativ VII Microscope package contains a 10X Huygens eyepiece and three achromatic objectives, magnification 3X for surveying the specimen, 8X for close observation of cells and cell nuclei, and 40X for the examination of fine structures.

Coarse focusing is carried out by moving the tube; for fine focusing, a knurled knob controls a threaded spindle carrying a precision prism. This was an innovation of Carl Zeiss and constituted the standard for precision and functional stability for decades to come.



## Tests with the diffraction kit.

A diffraction kit, as used by Ernst Abbe to document his theory of image formation in the microscope, is part of the Stativ VII package together with instructions for its use.



## Limited edition.

The issuance of this reproduction of the Carl Zeiss Stativ VII Microscope is linked with two historical dates: 100 years have passed since the discovery of the tubercle bacillus by Robert Koch, and it is the 125th anniversary of the start of microscope production in the Zeiss plant in Goettingen, West Germany.

Each of the 1000 Stativ VII Microscopes bears the Carl Zeiss signature and edition number.

You will receive this meticulously crafted microscope complete with a 10X Huygens eyepiece and three achromatic objectives (3X, 8X, and 40X). You will also receive an Abbe diffraction kit, a diatom test specimen and two thin-section tissue specimens. The microscope, accessories and instructions are all fitted into a handsome mahogany case.

**The price: $1,750**. Serial numbers in the edition of 1000 will be given out on a first come, first served basis.

*From 1984 pamphlet describing the Stativ VII replica.*

telescope.

However, before we start with the diffraction apparatus and the many experiments it allows, a brief introduction into Abbe's theory is in order. As has been pointed out, geometric optics are not able to explain resolution or the process of image formation itself. Only the wave theory of light is able to satisfy that condition.

A point is due to the wave nature of the light, imaged as a diffraction disc. G.B. Airy divides the specimens into Selbstleuchter (producing their own light) and Nicht-Selbstleuchter (not producing their own light) in the elements of the image. Two points are resolved if the light intensity between them is at least 80% of that of the main maxima (each in the center where the image of the point is supposed to be).

The illuminated points of the specimen are emitting coherent waves because they are hit by parallel wave fronts of an infinitely distant light source. These coherent waves interfere and produce an interference figure. According to the single elements of the latter, the amplitudes have to be summed up. Their square values give the light intensity.

## THE ABBE THEORY

The Airy method does not explain all the factors on which the resolution depends. Credit for solving this problem is due principally to Ernst Abbe. He assumed that the microscope objective images not only the specimen but also the light source illuminating the specimen. Provided that the light source is very small and at infinity (auxiliary lenses), a single-plane elementary wave travels through the specimen and is made convergent by the objective. In the rear focal plane of the objective, one finds the image of the light source (the so-called primary image). From here, the wave continues to travel, however, now as a divergent spherical wave, and at a certain distance behind the objective it produces a homogeneously illuminated area. A specimen brought into the beam will influence and change the image of the light source, which will then reproduce the specimen.

A more dramatic and graphic illustration is possible when the Abbe diffraction apparatus is used. A regular divided grating will substitute for a specimen because it will most graphically illustrate that all objects for microscopy have the structure of an absorption or phase grating. Every specimen is, in the optical sense, an irregular grating consisting of many very small areas of different optical properties: absorption, density, diffraction, refractive index, etc.

## FIRST OBJECT

The first object in the Abbe diffraction plate is a line grating, Figure 2A, with spacing of 16 microns on top and 8 microns on bottom. All lines are resolved because all diffraction maxima are present, as shown in Figure 2B, the primary or diffraction spectrum of the object. In all cases, this diffraction spectrum can be observed only by removing the ocular and looking down the tube, or by using a phase centering telescope. Here, we see the main maxima (center) and the neighboring 1st, 2nd, and 3rd orders.

We will now demonstrate the progressive deterioration of resolution as these orders are removed by reducing the N.A. of the objective. Figure 3A shows the diffraction spectrum with just the main maxima and two neighboring maxima on either side. When this condition exists, the resulting image of the grating has lost most of its resolution, as shown in Figure 3B. The lines on the top are still resolved but the finer bottom lines have now all but disappeared.

Progressing further with the apperture reduction is shown in Figure 4A. Here only the main maxima is present. Figure 4B shows the resulting image of the grid. No lines are resolved. A single diffraction maximum, regardless of what order it is, cannot produce an image that is similar to the specimen.

The line grating is now replaced by a point grating, Figure 5A. The distance between points is 12 microns, and all are resolved due to all the orders being present, as shown in Figure 5B. If a lmm. slit is placed in the system, all orders except those in the north-south direction are eliminated (Figure 6A.) Under these conditions, the dots of the grid now become lines (Figure 6B.)

If the slit is rotated, as shown in Figure 7A, the line system rotates simultaneously. The lines are always perpendicular to the slit (Figure 7B.) The dots are only resolved in the direction of the diffraction spectrum. When the interference orders are not present, the dots are not resolved and fuse to become lines.

These are but a few examples of the more than 60 experiments performed by Abbe to prove this theory.

The story does not end here, and is in fact only the beginning. Abbe was still not satisfied. He was looking for new ways to provide still better correction of the chromatic defects of microscope objectives. He calculated objectives constructed of hypothetical glass that did not exist, and it was this determination which eventually led to the development of the apochromats.

In 1873, the first "Polyop-objective" was made in the Zeiss workshop, following Abbe's calculations. The performance of this objective with regard to its spherical and chromatic correction fulfilled Abbe's expectations. This was a dry objective with a 3mm. focal length and numerical aperture of 0.83. It was peculiar in that it made use of a liquid lens in place of a lens of a non-existent glass.

In this objective, one of the four glass elements in the system was a lens-shaped cavity between two glass lenses, filled with cassia and anise oil. In 1876, a "Polyop water objective" followed with a focal length of 3mm. and an N.A. of 1.15. This lens also consisted of four elements, one of which was a liquid lens of pure cinnamic aldehyde.

In 1879, Abbe announced a new calculation: a partial apochromat with a 3mm. focal length and an N.A. of 1.40, designed to use a zinc chloride solution as the immersion medium.

## DREAM UNREALIZED

In spite of all he had achieved, Abbe's dream of an objective free of chromatic aberration, the apochromat, could not be realized. It is at this point that the third member of the "Four Horsemen" of microscopy comes into the story. In 1879, Abbe met Dr. Otto Schlott, a glass chemist, and this meeting led to overcoming the last hurdle in the development of a microscope objective free of chromatic aberration.

Schott's development of the necessary glass melts to obtain Abbe's desired degree of correction in the new apochromat objective was announced in 1886. New glasses are constantly being developed to further improve the performance of the light microscope, but Abbe and Schott surely blazed the trail for what we now take for granted in modern microscopes.

The last member of the "Four Horsemen" is Prof. Dr. August Koehler. Any serious user of the microscope is familiar with Koehler illumination, which is universally used throughout the world. However, the illuminating system that bears his name was not his only contribution to microscopy.

In October 1900, he became scientific officer at the Zeiss factory in Jena. It was there that he developed the ultraviolet microscope. As a radiant source, he used a spark gap between two cadmium electrodes. He then proceeded to develop a monochromator to isolate the cadmium line at the wavelength of 275nm. Von Rohr computed monochromatic objectives with their spherical aberrations corrected for this wavelength.

Using this instrument, he made the first observations by fluorescence microscopy of the auto-fluorescence of biological specimens excited by ultraviolet radiation. He also reported that, in the ultraviolet image of unstained biological specimens, the chromatin of the cell nuclei was differentiated from the cytoplasm in distinct contrast. Unfortunately, he was not to know that the wavelength he selected, 275nm, was near to the absorption maximum of nucleic acids.

Complete details and data relevant to the achievements of these great men would fill many volumes. The foregoing is but a sketchy outline of four great men who have made microscopy what it is today.

*This article, together with most of the accompanying illustrations, orginally appeared in the September/October 1987 issue of "Functional Photography" magazine. (210 Parkways Park Drive, Woodbury, N.Y. 11797.)*

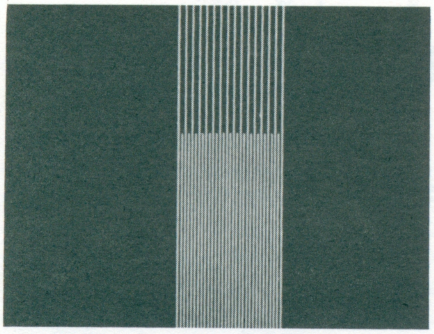


*Figure 2A.*

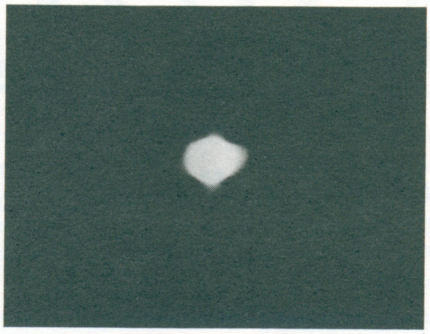


*Figure 4A.*

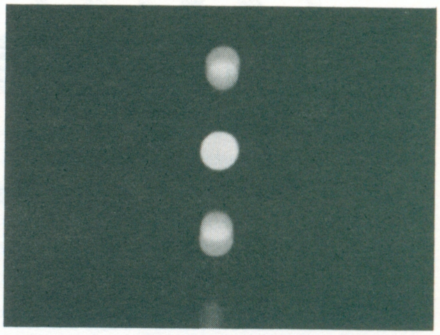


*Figure 6A.*

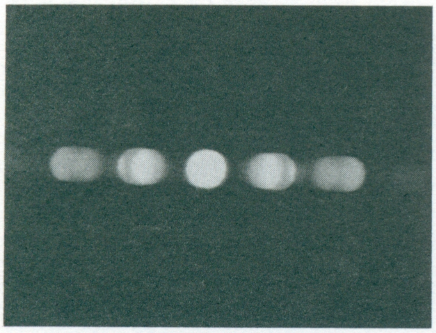


*Figure 2B.*

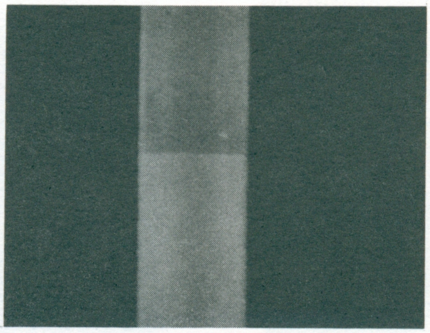


*Figure 4B.*

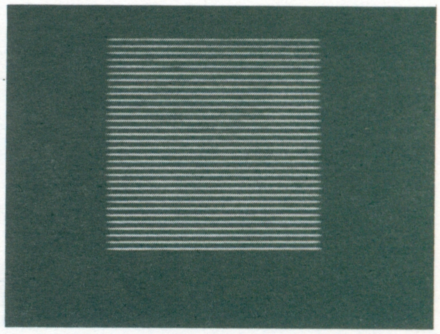


*Figure 6B.*

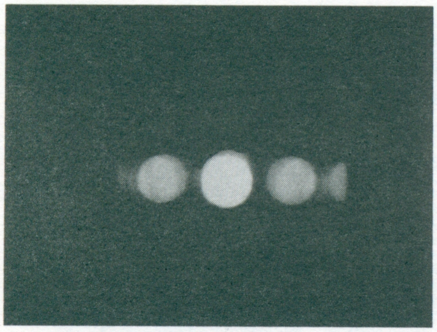


*Figure 3A.*

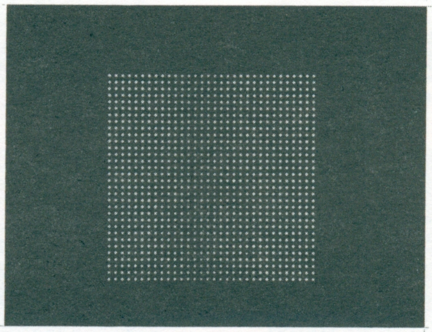


*Figure 5A.*

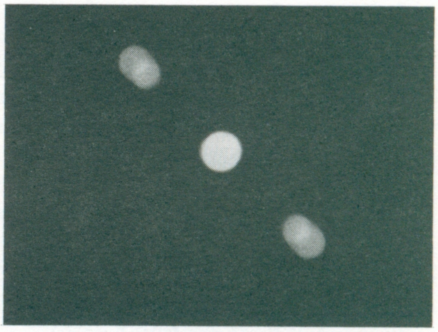


*Figure 7A.*

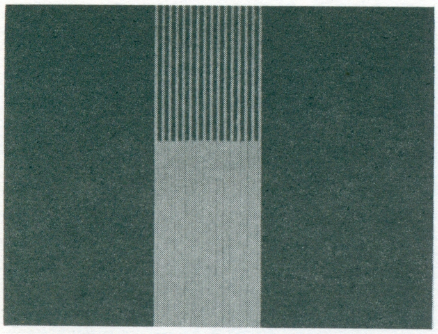


*Figure 3B.*

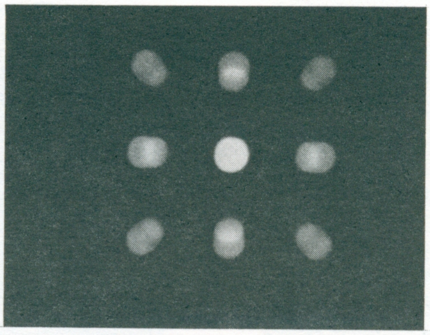


*Figure 5B.*

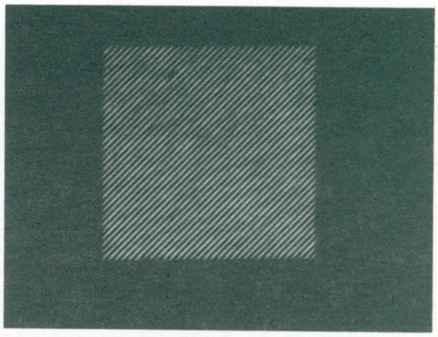


*Figure 7B.*

# PREWAR ZEISS IKON 35s

## *Larry Gubas, Edison, New Jersey*

If you search the product lines of the various camera manufacturers of the 1930's, you will begin to see a gradual movement to the 35mm. camera. But in sheer numbers alone, Zeiss models virtually outnumbered the competition. A good place to start a comparison is a late 1930's photographic magazine which compares the cameras of the day. The one I chose was in the June 1939 edition of US Camera. It is an article by Willard D. Morgan entitled, "Miniature Cameras (Their Characteristics and Costs, a Detailed Analysis)."

This article identified 200 cameras which were then on the American market. Approximately half were classified as "miniature" with formats from 1 x 1" to 2-1/16 x 2-1/2". There were 28 distinct 35mm. cameras listed.

Yes, there were two Leica cameras (Standard and IIIb) since there were rarely more than 2-3 different Leica models available at any one time. Kodak marketed only the Retina cameras of Dr. Nagel and three inexpensive Kodak 35 cameras until 1940 when the Ektra came onto the market in very limited numbers. There were Peggys, Robots, the Kine Exakta, 3 Dollinas, a Welti, a Weltini, an Agfa Memo, a Burke and James Watson clone of the Retina, and Argus A's and C's. But by and large Zeiss dominated the scene with eight uniquely different 35mm. cameras.

The first of these Zeiss cameras was the black Contax I which was produced in at least 7 distinct variations from 1932 to 1938. Its actual manufacture ended in 1936 when the Contax II took over the system line. It had a full range of distinct system components: an array of Zeiss lenses, a great number of viewfinders, a full family of filters, and just about anything that a contemporary photographer could conceivably want. The Leica was its only competitor from a camera system point of view. The chrome Contax II was manufactured in and available from early 1936. The Contax III was available from late 1936. Both cameras were manufactured throughout the war in limited numbers until 1945 when the factories were bombed and later disassembled by the Russians.

The Super Nettel followed in 1934 and was available in two official versions through 1938. The Super Nettel I was a black and nickel camera; the II was chrome. The camera was, however, totally redesigned with regard to the rangefinder (from mirror to prism) without model change during its product life. The easiest way to discern this is to compare the direction in which the rangefinder mechanism traveled on the different early and late models. These models came with either one of two Tessars (f2.8 or 3.5) or an f3.5 Triotar 5 cm. lens and a Contax-style shutter.

The Contaflex TLR was available from 1935-1941 and was the Rolls Royce of its time. It cost more than a typical American automobile of the day! It also had many of the family of lenses available for the Contax but in a different although similiar mount. The shutter was a modified Contax-style shutter. It never had a competitor in the 35mm. TLR market. However Depression costs and the large size of the camera compared with the Contax kept sales of this camera low.

The Tenax II was available from 1938 but was probably only actually manufactured in that year. It was designed with a special interocular Compur shutter by Carl Zeiss subsidiary F. Deckel. It had a small group of four interchangable lenses, each with its own shutter. Two were Tessar and Sonnar normal 4 cm. lenses. The other two were a wide angle Orthometar 2.7 cm. and a modest telephoto, a 7.5 cm. Sonnar. The Tenax II had a rapid advance lever and chrome styling and still appeared in the US price lists in October, 1941.

The Tenax I came out much later, in 1938, and had a modest Novar lens and a folding rapid advance lever. This camera never sold well and was available through the end of 1941.

The Nettax was made in 1937 and was available through 1939. It had a Contax-style shutter. Two different 5 cm. Tessars (f2.8 and F3.5) were available, as was a 105mm. f5.6 Triotar. There was also a non-rangefinder coupled 2.8 cm. Tessar wide angle.

The following table gives an indication of the prices of this range of cameras at the top of their market:

| *CAMERA* | *LENS* | *DATE* | *PRICE* |
|---|---|---|---|
| *Contax I* | *Tessar f2.8* | *1937* | *$184.50* |
| *Contax II* | *Tessar f2.8* | *1941* | *$225.00* |
| *Contax III* | *Tessar f2.8* | *1941* | *$267.00* |
| *Contaflex* | *Tessar f2.8* | *1937* | *$321.00* |
| *Super Nettel I* | *Tessar f2.8* | *1935* | *$110.00* |
| *Super Nettel II* | *Tessar f2.8* | *1936* | *$140.00* |
| *Tenax I* | *Novar f3.5* | *1939* | *$ 60.00* |
| *Tenax II* | *Tessar f2.8* | *1939* | *$171.00* |
| *Nettax* | *Tessar f2.8* | *1937* | *$165.00* |

One indication of the quality of the Zeiss line of cameras comes from a repair technician of my acquaintance who maintains that the Contax shutter remains an excellent durable design. One of the major problems was the shutter tapes. Tapes made of newer fabrics like nylon or other synthetics will far outlast those of the 1930's and prove the shutters durability and accuracy. The special Compur shutter which Hubert Nerwin designed with Deckel for the Tenax II is also a very reliable product. It is rare to find one of these shutters malfunctioning even today.

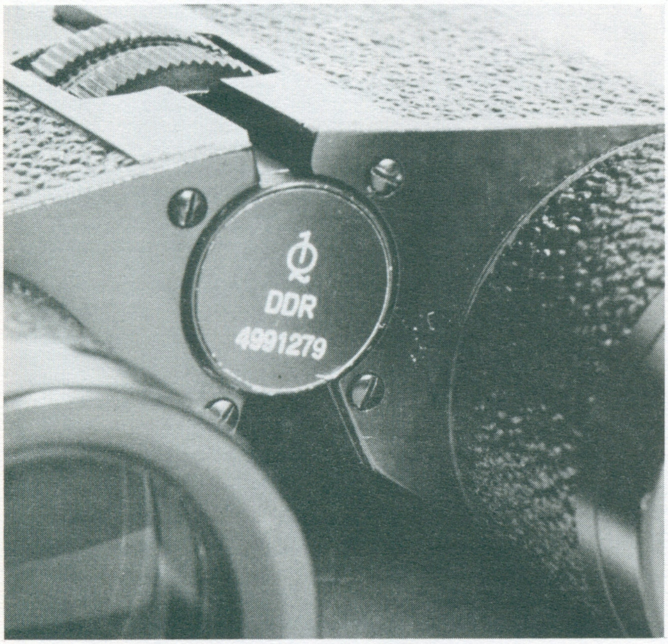
Since there is no feasible way of reproducing the sizeable Willard article from US Camera, I have made a supply of copies and will send one to you if you would send me a self-addressed stamped envelope. My thanks to Dr. Robert Helm whose early article in Shutterbug brought me to the Zeiss Ikon line of cameras as a hobby. Each time I work with one of these cameras, I am amazed by its durability and design.

# "PRIME QUALITY" SYMBOL

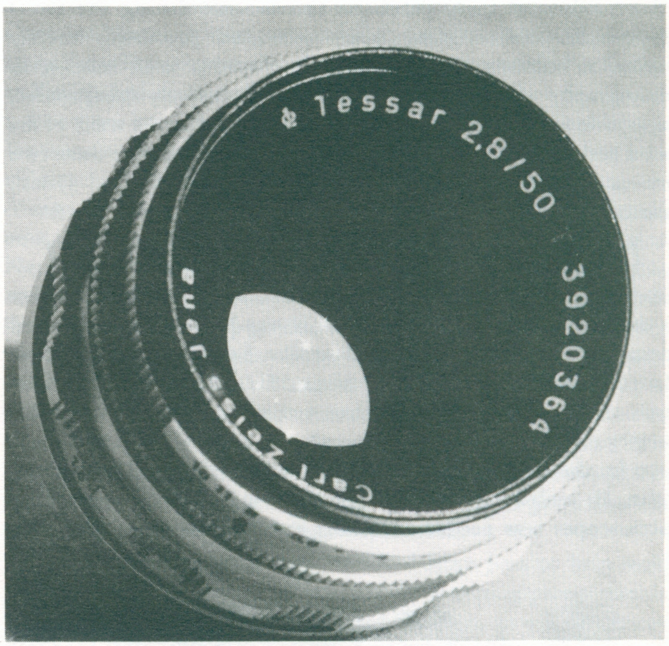
*Nicholas Grossman, Rockville, Maryland*

A number of products fabricated in Jena after World War II are marked with an unusual symbol: a numeral "1", partially encircled by a capital letter "Q". This symbol stands for the German word "Primaqualitaet" — in English, "Prime Quality." Several photographic lenses, monoculars and binoculars that bear this symbol are shown in the illustrations below.

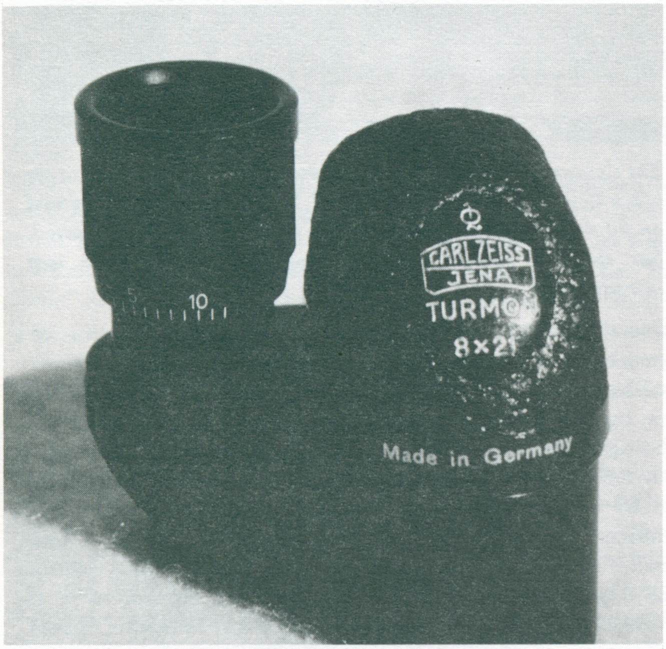
The author has been unsuccessful in locating any references to the use or significance of this designation. Jena catalogs and other Jena publications do not refer to it. One can only speculate that the factory practices "selective assembly" and that products with particularly tight dimensional or performance standards are marked with this symbol.



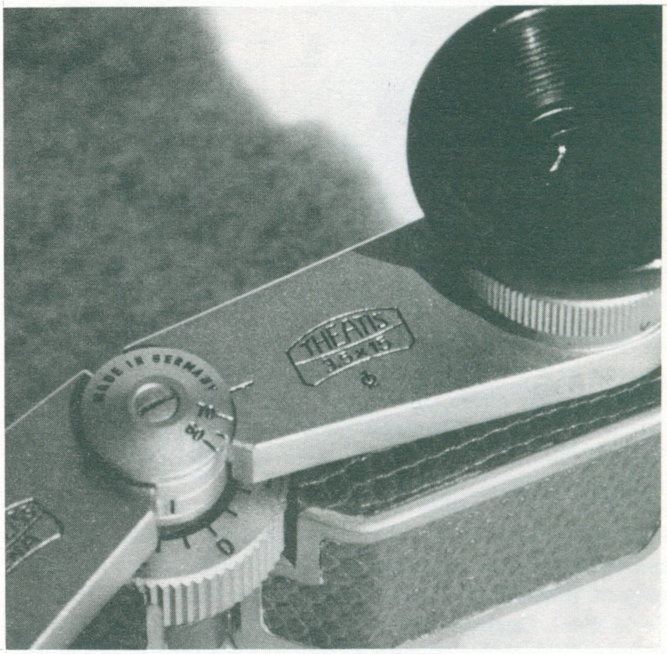

*Postwar binoculars from Jena.*




*Lens with 42mm. thread for Contax S.*




*8x21 "Turmon" folding monocular.*




*3.5x15 "Theatis" opera glasses.*

# COMPARING THE PREWAR LEICA AND CONTAX

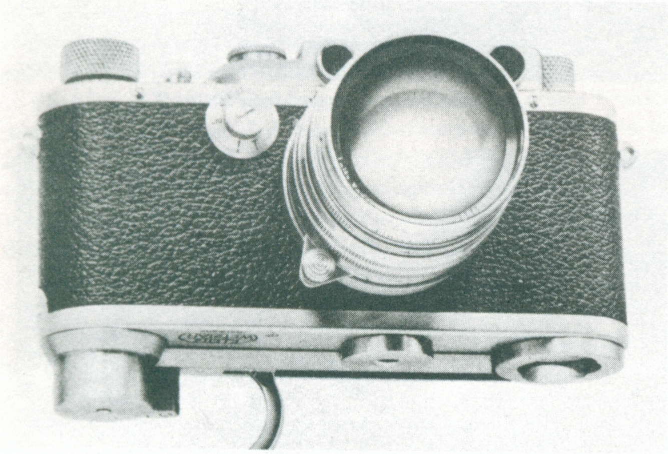
*Robert A. Helm, Cincinnati, Ohio*

## PART I

Some type of 35mm. camera can now be found in most American households, replacing the folders and box cameras of the distant past. The trend toward 35mm. began with the advent of two cameras, Ernst Leitz's Leica and Zeiss Ikon's Contax. Few could afford either of these precision instruments during the Great Depression. Nevertheless, many who had previously merely pushed a button on a Brownie, developed a keen interest in photography after acquiring one of the relatively inexpensive, adjustable rangefinder cameras which followed in the wake of the Leica and Contax. It is interesting to critically compare these two prewar German classics which indirectly so popularized 35mm. photography in the United States and throughout the world.

### DEVELOPMENT OF THE LEICA I

Ernst Leitz, Wetzlar, introduced the first *successful* 35mm. camera at the Leipzig Spring Fair in 1925. It was based on a design and format which a highly skilled senior Leitz employee, Oskar Barnack, had been working on since 1914, primarily in his spare time and more as a personal than a company project. Barnack's camera might have never been produced commercially had it not been for the rampant inflation in Germany in the early 1920's. Ernst Leitz II realized that a product having wider appeal than microscopes was needed to attract stable American dollars and



*In this illustration (reproduced from a 1937 advertisement) the presence of a slow speed dial identifies the Leica as a IIIa (from 1935) or a III (from 1933). The lens is the seven element Leitz Xenon 5 cm.F/1.5, available from 1936. An accessory Rapid Winder (also from 1936) has been attached, replacing the camera's regular baseplate.*

British pounds. Barnack had kept Ernst Leitz II and his father (the family firm's founder who died in 1920) fully informed regarding his spare time project, which stretched over the decade including World War I. During that period Barnack progressively improved his focal plane shutter (which at first was not even self-capping). The shrewd younger Leitz had patented every new feature of the

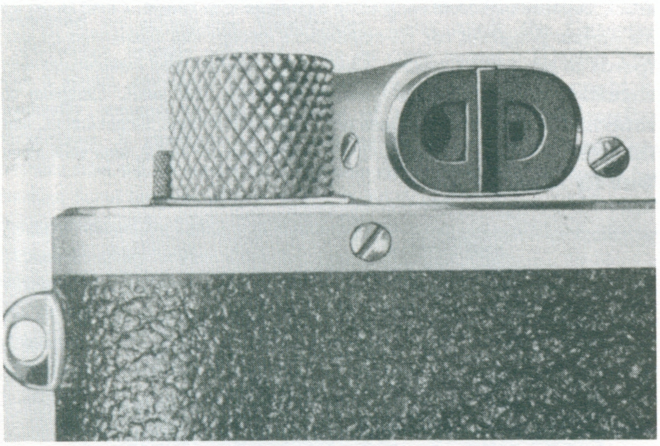

*The Contax II and Contax III are shown with a late version of the black Contax I. Carl Zeiss 5 cm. f/1.5 Sonnar lenses are mounted on all three cameras. (Lenses for the Contax I were nickel plated, but the last version was still available when chrome was introduced.)*

camera. In 1923 he decided to produce a "null series" of 31 Barnack cameras for various European photographers to test.

A large majority reported the instrument to be a useless toy, but a few suggested that it might be an effective type of camera for photographers who wished to work unobtrusively. Ernst Leitz II was faced with a dilemma. Without a new product he would be forced to discharge a large number of his skilled microscope workers. But he could keep them employed, making a small, precise camera which might not sell. After a long Saturday morning board meeting he announced his decision with the German equivalent of: "We shall manufacture Barnack's camera".

The Leica (for LEItz CAmera), as Barnack's instrument was ultimately named, initially had a 5 element, fixed 5 cm. f/3.5 lens, designed by Leitz's Max Berek. Because of patent restrictions it was at first simply called a Leitz Anastigmat. But soon the lens, very slightly changed, was renamed "Elmax" (from the initials of Ernst Leitz and Berek's first name). Later in 1925, using more highly refractive types of glass, Berek redesigned the 5 cm. f/3.5 as a 4 element lens. It was called the Elmar and was better corrected than the Elmax.

The f/3.5 Elmar made "small negative-large print" photography a reality. No one viewing an 8"x10" print made from a Leica negative could ever again call Leitz's camera a toy. And, as better cine film and fine grain developers became available, 11"x14" and larger Leica pictures became commonplace. Ernst Leitz II had gambled and won.



*The rangefinder ocular (left) and viewfinder ocular (right) on the 1938 Leica IIIb were in close proximity rather than 3/4 inch apart as on previous models. Rangefinders clarity was achieved by moving the small lever visible just to the left of the rewind knob. (On the III and IIIa, this function was accomplished by rotating the rangefinder ocular through 90°.)*

In the spring of 1930 three Elmar lenses (3.5 cm. f/3.5, 5 cm. f/3.5, and 13.5 cm. f/4.5), all with a new interchangeable screw mount, became available. At first a Leica had to be returned to the factory for fitting if the camera and the new lenses had not been purchased as a set. After December, 1930, the lens mount was standardized on both new and returned cameras so that all lenses were readily interchangeable. Focusing was by scale, but many photographers utilized a Leitz accessory rangefinder, attached to the camera's clip, to estimate distances.

By 1932, Berek had developed additional interchangeable Leica lenses. A "speed lens", the 6 element 5 cm. f/2.5 Hektor (allegedly named after Berek's dog) was not as well corrected as the slower Elmar. A 6 element 7.3 cm. f/1.9 Hektor was primarily designed for available light and stage photography. In 1931 a 9 cm. f/4 with a broad barrel came out. It was not popular because of its size; collectors who value it because of its rarity refer to it as the "fat Elmar". It was soon replaced with a slender, quite popular 9 cm. f/4 Elmar. A rare lens, greatly valued by collectors who call it the "mountain Elmar", also appeared in 1932. The light weight and reasonable price of this 10.5 cm. f/6.3 optic appealed to alpinists.

## *THE RANGEFINDER LEICA II*

In 1932 an additional model, the Leica II, appeared with a built-in rangefinder, coupled to all of the interchangeable lenses available at that time. When this new model was first contemplated, it is alleged that Barnack issued a decree to his design staff that any rangefinder had to be built within the confines of a ruler, placed across the top of the non-rangefinder model. Thus the Leica II had the same small dimensions as the original Leica. Because of the design limitations imposed by Barnack, the length of the rangefinder base was only 1.5 inches. (It is doubtful that any other camera manufacturer could have made such a short rangefinder work so well with lenses as long as 13.5 cm.. But Leitz was not a camera company; it was a microscope firm whose founder has already in the 19th century introduced new standards of precision in that industry.) The effective rangefinder baselength was increased to 2.25 inches in 1933 with a focusing ocular having 1.5x magnification.

The 1932 introduction of rangefinder coupling for all lenses from 3.5 cm. (later 2.8 cm.) to 13.5 cm. gave the Leica a tremendous advantage over many lesser miniature cameras marketed subsequently. But a new rival on the scene was not a lesser camera; the specifications of the 1932 35 mm. Contax, equipped with a fine stable of Carl Zeiss lenses, were superior to those of the Leica.

## *ZEISS IKON AND THE CONTAX I*

Zeiss Ikon was formed in 1926 under the auspices of Carl Zeiss, Jena, the world's leading optical concern. This new camera company was an amalgamation of four large photographic firms: Ernemann in Dresden; Ica, a Zeiss subsidiary, also in Dresden; Contessa-Nettel in Stuttgart; and C.P. Goerz in Berlin. By its size alone Zeiss Ikon expected to overwhelm all competition in Europe as Kodak had done earlier in the U.S.A.

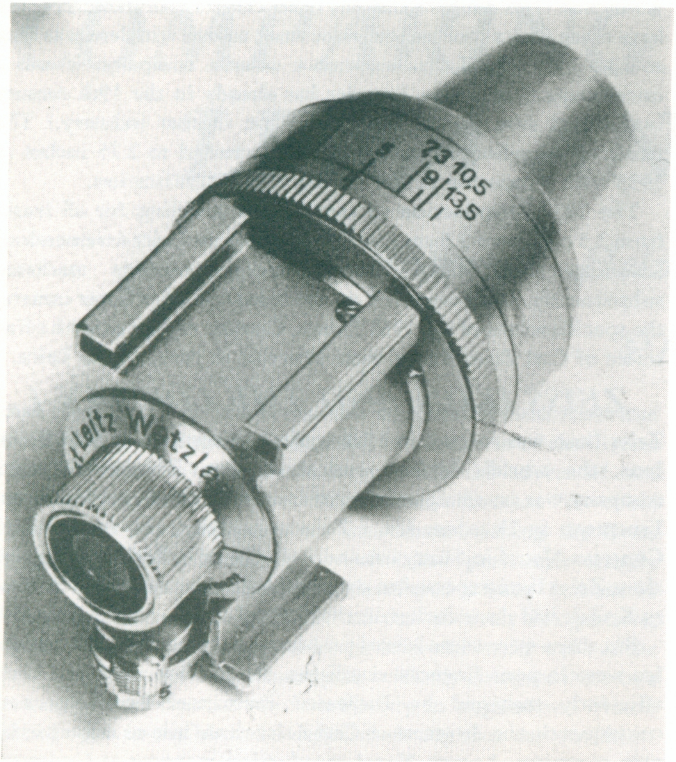
But there were some initial problems. All the companies except Ica were in poor financial condition. Production at Ica had been efficiently managed by Professor Emmanuel Goldberg, and consequently the directors of Carl Zeiss chose him to organize the new company. August Nagel, production manager at Contessa-Nettel, had the reputation of being an outstanding camera designer and was considered to be "Europe's focal plane shutter king". he had expected to head up production at Zeiss Ikon. Disappointed by Goldberg's appointment, Nagel soon left the new company, returned to Stuttgart, and started his own "Nagel Werke". His miniature Pupille was superior to, and outsold, the somewhat similar Kolibri, Zeiss Ikon's first *new* camera. Zeiss Ikon's 1927 catalogue contained most of its parent companies' cameras, 120 models in all! Goldberg's initial task was to sort the good from the mediocre, and to avoid needless duplication.

Heinz Kueppenbender was recruited from Jena to help make decisions regarding new designs. It soon became apparent that the old-fashioned cameras inherited by Zeiss Ikon, as well as the new Kolibri (designed before Kueppenbender's arrival), were no match for the Leica which was changing the way photography was practiced. Kueppenbender convinced Goldberg that more design talent was needed. New engineers were hired and organized into 4 main groups under Kueppenbender: Camera Design; Shutters; Enlargers and Projectors; and Cine Equipment. Zeiss Ikon was beginning to roll.

At Carl Zeiss there were no problems like those which existed initially at Zeiss Ikon. It has been said that the greatest benefit to Zeiss from the 1926 amalgamation was the acquisition of Ernemann's young and brilliant lens designer, Ludwig Bertele. At Ernemann he had developed the fastest lens in existence, the f/1.8 Ernostar. It was mounted on the revolutionary Ermanox of 1924, which, if it had used roll film rather than small plates, might have hastened the advent of miniature photography.

Bertele immediately went to Jena to take charge of photographic lens development at Carl Zeiss. Because of the success of the Leica, Bertele initiated a special project in 1929, the creation of an entire series of new lenses for a Zeiss Ikon 35mm. camera yet to be designed. Toiling for years with mechanical desk calculators, Bertele and his two assistants covered huge stacks of paper with computations. By 1932 Carl Zeiss had 6 interchangeable lenses (and 4 more by 1933), ready to attach to the bayonet mounts of the new 35mm. rangefinder camera of Zeiss Ikon.

Bertele's most radically new lenses were the f/2 and f/1.5 Sonnars in the 5 cm. focal length established as "standard" by the



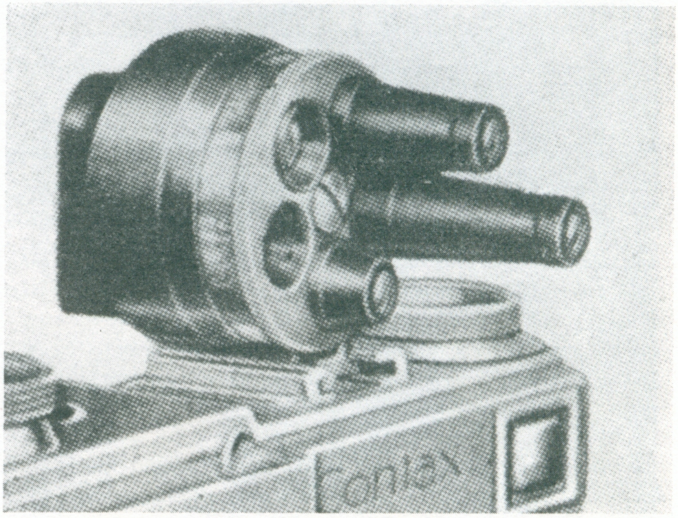
*The Leitz Universal Viewfinder (VIDOM). The knurled ring in front of the accessory clip adjusted the viewfinder for the focal length of the attached lens. Here the "5" is lined up with the longer of the two index marks; this is the proper setting for a distant scene with a 5 cm. lens. For closer distances the shorter index mark was used to narrow the field of view slightly. A 90° rotation of the knurled ring surrounding the ocular produced an upright image. To correct for parallax, the VIDOM could be tilted by adjusting the lever below the ocular.*

Anastigmat/Elmax which Max Berek had designed for the Leica and later redesigned as the famous f/3.5 Elmar. But Bertele's Sonnars were far better than Berek's 5 cm. f/2 lens, the 6 element 1933 Summar. The f/2 and f/1.5 Sonnars had 6 and 7 elements, respectively. But since these were cemented as doublets and triplets, each Sonnar had only 6 glass-air interfaces, no more than the much simpler 4 element Elmar. This was extremely important in the days before lens coating because more than 6 air-glass surfaces produced the kind of excessive flare from which the Summar suffered. (Although lens coating was first developed and patented at Carl Zeiss in 1935, its civilian application was restricted by the Hitler government.)

The first Contax camera of 1932, designed by the camera and shutter groups organized under Kueppenbender, had outstanding specifications. This camera, as contrasted with the 1932 Leica II, possessed: two bayonet lens mounts (rather than a threaded mount), the inner for 5 cm. lenses and the outer mount for all other interchangeable lenses; a metal (rather than cloth), vertical (rather than horizontal) focal plane shutter to 1/1000th (rather than 1/500th) sec.; a 4 inch (rather than a 1.5 inch) rangefinder.

But in the field, the Contax did not handle as well as the smooth working, fast-focusing Leica. It was relatively large camera; to reduce its height, the designers had placed the shutter winding and film advancing knob in an awkward location on the front, next to the lens. After the rangefinder images of the 1933 Leica III were magnified 1.5 times, the Contax rangefinder was totally redesigned (in 1934) to greatly improve its accuracy. Two round prisms, rotating 90° in opposite directions, replaced the previous mirror which had pivoted only 3° as the lens was focused from infinity to 1 meter. The new rangefinder was capable of accurately focusing the 18 cm. f/6.3 Tele-Tessar K, a feat much beyond the Leica's capabilities.

A separate slow speed dial (down to 1 sec.) was an additional feature of the Leica III. In 1933, slow speeds to 1/2 sec. were added (in a rather inconvenient manner) to the Contax. Leitz placed a 1/1000th sec. speed on its 1935 Leica IIIa to compete with the Contax's top speed. Whenever Leitz introduced new features, the older models were not discontinued. This a Leica dealer's stock was never outdate, and the consumer, purchasing a less expensive model, could always have his camera converted to the very newest version. The situation with the Contax was different. Zeiss historians now recognize at least seven versions of the black Contax I. The variations were externally visible so that a dealer's stock became obsolete each time a change was made. Zeiss Ikon had no update program for its customers except the additions of slow speeds to the 1932 Contax. Thus both dealers and customers were alienated, and the black Contax did not sell well. Despite the superiority of Bertele's lenses over those of Berek, Ernst Leitz, long the arch rival of Carl Zeiss in the microscope field, was still ahead with its Leica.



*The Carl Zeiss Universal Revolving Viewfinder on a Contax II.*

## *THE CONTAX II AND III*

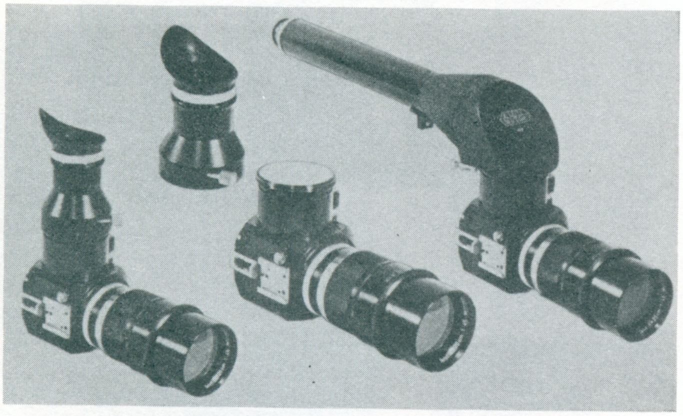
Hubert Nerwin, arriving at Zeiss Ikon in 1932, had emerged as the company's most gifted engineer. Already victimized by Nazi persecution, Goldberg left Dresden in 1932 to head a Zeiss subsidiary in Paris. It thus became necessary for Kueppenbender to assume additional managerial duties so that, in 1934, Nerwin became full supervisor of design. Camera production blossomed under Nerwin. Zeiss Ikon could soon boast of having the world's most complete and diverse selection of really fine cameras, including an entirely new Contax II. Introduced in 1936, it was finished in chrome, available on the Leica since 1933. The knob for shutter winding and film advancement was on top rather than in front. But the main new feature was a "swinging wedge" rangefinder design producing a combined rangefinder and viewfinder image. The shutter was also much improved. (I am not just referring to the new 1/1250th sec. top shutter speed which must have been primarily an advertising gimmick.)

Soon the Contax III appeared. It was exactly the same as the II except a selenium cell exposure meter, developed by Kueppenbender, was a permanent part of the top plate. After 1936 many considered the Contax II to be the finest 35mm. camera available. The bulkier and heavier Contax III was deemed less desirable (and time has demonstrated the meter to often have a rather short life span after which it became a useless hunk of metal and glass). In 1938 Leitz introduced the Leica IIIb with very close placement of rangefinder and viewfinder oculars. That this may have been a "desperation model", introduced only because of the advanced design of the combinded rangefinder and viewfinder on the Contax, is suggested by the fact that, for the first time, Leitz had not engineered any provision for upgrading previous Leica models to the IIIb.

## *LEICA AND CONTAX ACCESSORIES*

With a full complement of interchangeable lenses (2.8 cm. to 13.5 cm. for the Leica and 2.8 cm. to 18 cm. for the Contax), a camera's accessory clip required either a separate viewfinder for each focal length or a single adjustable viewfinder to encompass all of these focal lengths. Both solutions were used, but most photographers preferred an adjustable viewfinder. Leitz made the Universal Viewfinder, usually referred to by its code name: VIDOM. This was a small, reversed telescopic device. A scaled cam could be manually rotated to tilt the axis of the VIDOM for parallax correction. A portion of its tubular housing was formed by a circular dial which controlled the size of an internal diaphragm for marked focal lengths of 3.5, 5, 7.3, 9, 10.5, and 13.5 cm. (Although not sanctioned by Leitz, my VIDOM's diaphragm could actually be opened slightly wider than 3.5 cm. to approximate the field of a mounted transparency taken with a 2.8 cm. lens.) Regardless of the size of its aperture, the diaphragm maintained a rectangular 2:3 proportion.

Depending on the orientation of the VIDOM with respect to the

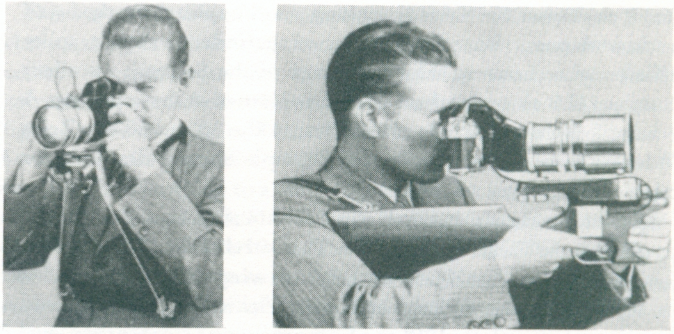


*The Mirror Reflex Housing (PLOOT), with the Telyt 20 cm. f/4.5 lens attached, is displayed complete (left) and with its magnifier sleeve removed (center). The lever at the base of this sleeve could be "flipped" to bring the 30X magnifier into view and then rotated to focus that magnifier (after removing the 5X magnifier from the sleeve). On the right, the focusing telescopic eyepiece of the Leica Gun has been attached.*

orientation of its ocular, the image viewed within the jet black margins of the diaphragm would be either upright and reversed laterally, or correct laterally but inverted. Since an upright view is preferable to an inverted one and lateral reversal is tolerable, the user would orient the ocular to produce an erect image. But upon rotating the camera (and thus the VIDOM) through 90° to take a picture in the alternate format, the image would be upside down until the ocular was rotated 90°. This peculiarity was a nuisance, but it had a subtle benefit; the accuracy of framing truly vertical or horizontal lines (e.g., a horizon over water) was increased by a factor of 2. The VIDOM housing was small and had a low profile; any Leica on which a 2.8 cm., 3.5 cm., or collapsible 5 cm. lens was mounted would easily slide into a pocket with a VIDOM attached.

The Zeiss Revolving Viewfinder was much larger than the VIDOM. Five small turret lenses of varying length were radially arranged on its rotating front disk. Three of the five turrets were for 5, 8.5, and 13.5 cm. focal lengths; the remaining two could be selected by the customer from three focal lengths: 2.8, 3.5, or 18 cm.. The disk was rotated to bring the turret lens which corresponded to the lens mounted on the camera into line with the eyepiece. For parallax compensation there was a distance scale along side each turret lens, so that the user could variably adjust the disk rotation just shy of each infinity detent. The upright and laterally correct image was divided by a full frame cross hair to help maintain horizontal and vertical integrity. The image produced by each turret was magnified or reduced to obtain an identical frame size for each focal length. This represented an advantage over the small 13.5 cm. image of the VIDOM, but the latter's 3.5 cm. image was larger than that of the Zeiss instrument.

In 1935 Leitz marketed the 20 cm. f/4.5 Telyt and, 2 years later,



*Two methods of supporting the Carl Zeiss 18 cm. f/2.8 Olympia Sonnar, mounted on the 1938 Flektoskop. (Prior to the advent of the Flektoskop, this 1936 lens was supplied with a longer barrel which coupled to the Contax rangefinder.*

the 40 cm. f/5 Telyt, both with 5 elements. (The latter was observed at the 1936 Olympics before it was actually catalogued.) Neither lens could be focused with the rangefinfer; rather, the relatively short barrel of each was screwed into a Mirror Reflex Housing (introduced in 1935 and commonly referred to by its code name: PLOOT). This in turn was screwed into any Leica body accepting interchangeable lenses. When the single plunger of a double cable release was depressed, the PLOOT's *long* reflex mirror, set at 45° for viewing, was raised, and the Leica's focal plane shutter was tripped an instant later. The ground glass of the instrument was circular. Its under surface was masked by a 24mm. x 36mm. rectangular metal frame which automatically rotated as the Leica body on the back of the PLOOT was rotated to take a picture in the horizontal or vertical format. The upright, laterally reversed image was viewed from above (with external light excluded) through a 5X magnifying eyepiece; this could be removed in favor of a small 30X magnifier which, flipped into view and focused on a crosshair, permitted aerial focusing of the central image.

In 1934 Carl Zeiss supplied a 4 element 30 cm. f/8 Tele-Tessar and a 2 element 50 cm. f/8 Fernobjectiv for the Contax. A telescopic viewfinder was mounted on each lens to approximate its field, and scale focusing (at the Inf. mark) was used for very distant scenes. For more exact framing and for focusing on closer subjects, a ground glass screen (with an attached magnifier) was bayoneted to the tripod-mounted lens. After focusing and composing, the screen was removed and the outer bayonet of the Contax body was then attached to make the exposure. This primitive procedure was cumbersome but reasonably effective, since the f/8 lenses were much too slow for action photography. A reflex housing (described below) for adapting the Contax to long focus and telephoto lenses did not appear until 1938.

A new chrome camera on which was mounted a startlingly huge lens was first spotted at Garmisch-Partenkirchen, site of the 1936 winter Olympics. The front element of the lens was at least as large as that of a Zeiss 50 cm. Fernobjectiv. But the few photographers with this equipment seemed to focus the lens with the camera's rangefinder, or to follow fast action with either a Zeiss Revolving Viewfinder on the camera, or a shoe-mounted finder on the lens. The new camera was soon identified by Zeiss Ikon as the Contax II, but the nature of the lens remained a mystery. It again appeared at the summer Olympics in Berlin. Finally, in the fall of 1936, the lens was catalogued by Carl Zeiss as the 18 cm. f/2.8 "Olympia-Sonnar", a name which is still recognized after more than 50 years.

Originally computed by Bertele to have 5 elements in 3 groups, it was the most sensational lens of its day. However, the experiences of the photographers who tested the new Sonnar at the 1936 Olympic Games exposed a flaw in the thinking of the Contax design group. The barrel of the new 18 cm. lens was originally designed exclusively for rangefinder coupling; the older 18 cm. f/6.3 Tele-Tessar K (K for Kupplung, i.e., coupling) worked well in this manner. But the Contax rangefinder was not quite sufficiently accurate to take advantage of the Sonnar's excellent acuity at f/2.8 since depth of field is so limited at that opening. A detachable focusing screen, utilized with the 30 and 50 cm. Zeiss f/8 lenses, was impractical for the Olympia-Sonnar, designed for action photography.

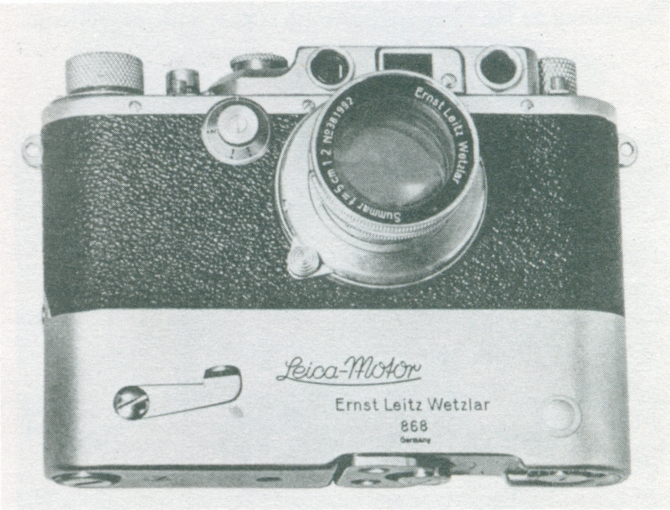
Zeiss Ikon clearly needed a reflex housing and this finally appeared as the Flektoskop in 1938. The barrel of the 18 cm. Sonnar was shortened and modified for reflex viewing. (The 30 cm. and 50 cm. lenses were also redesigned for the Flektoskop.) The ground glass image was reflected 90° to a 5x magnifying ocular for eye level viewing of both horizontal and vertical formats. However, the image perceived by the user of the prewar Flektoskop was upside down and laterally reversed. (This fact was never mentioned in any Zeiss Ikon catalogue; rather, the eyelevel viewing was stressed.) The Flektoskop could not be used on a Contax I because the film winding knob on the front of that camera was in the way. Thus the design of Leitz's 1935 PLOOT, with a constantly upright image (focused at either 5X or 30X) and attachable to *any* Leica model with an interchangeable lens mount, was clearly superior to Zeiss Ikon's 1938 Flektoskop.

E. Leitz, New York, the American importer of the products of Ernst Leitz, Wetzlar, also manufactured a few of its own Leica accessories. One of these was the Leica Gun (catalogued in 1938 and 1939, code word: RIFLE. It was primarily designed for use with the 20 or 40 cm. Telyt and was often illustrated with the latter in place. It could also be used with a 13.5 cm. Hektor mounted in a short barrel. The lens was attached in the usual manner to a PLOOT, modified to accommodate a long telescopic tube which extended all the way back to the right eye of the viewer whose face rested comfortably on the rifle stock's cheek-piece. The eyepiece of the telescopic tube was adjusted for individual vision by focusing on a cross hair. For composing and focusing the subject, the PLOOT's ground glass image was reflected by mirrors in such a way that it was perceived by the viewer as upright and unreversed laterally. The gun stock was firmly attached to the PLOOT by means of a baseplate. (When the 40 cm. Telyt was used, there was also an auxiliary baseplate for this heavy lens.)

The most ingenious feature of the RIFLE was the manner in which it activated the Leica. In addition to its attachment to the PLOOT, the camera (with its own baseplate removed) was connected to the stock by means of a special baseplate. The RIFLE had two triggers (much like those on a double-barrel shotgun). Applying a single pull to the front trigger advanced the film and wound the shutter (accomplished entirely internally through the baseplate connection). Squeezing the rear trigger activated a double cable release to raise the mirror of the PLOOT and release the shutter. It was an almost perfect system! The only defect was the inability to rotate the Leica body to take vertical pictures (as could be done with an unmodified PLOOT equipped with its regular eyepiece). However, the horizontal format was generally preferable for most animal shots in the wild.

The American-made portions of the Leica Gun were truly magnificent, complementing the precision of the PLOOT, Telyt lenses, and Leica camera. The stock was crafted and finished like that of a fine sport rifle. (The entire assembly so closely resembled a real rifle that it was totally banned in Germany during the war years.) Zeiss Ikon made a special harness and also an "Olympic Gun" (with none of the ingenious features of Leitz's RIFLE) to support the 18 cm. Sonnar and Flektoskop.

Leitz made a rapid winder for the Leica. A folding lever, incorporated into a special baseplate, wound the camera with two short strokes. In 1938 Leitz introduced a spring motor. Replacing the regular baseplate, it advanced as many as 12 frames with a single wind. Initially adjustable for either 1 or 2 frames per sec., later motors were simplified to run only at the faster rate. Leitz can actually lay claim to an even more significant "first" in motorization. (The 1934 Leica FF and 1936 Leica GG were basically Leica III and IIIa models, respectively, but both had huge cylindrical ends to accommodate sufficient film for 250 exposures.) From 1939 Leitz manufactured *electric* motors, each with a 24 volt battery power supply, to run these 250 exposure cameras. (Such electric motors were developed for military use and were never catalogued for civilian sale.)




*The focusing lever for the rangefinder, located in front of the rewind knob, identifies this Leica as the 1938 IIIb. The lens is the six element Leitz Summar 5 cm. f/2.0, first produced in a rigid mount in 1933, but only in a collapsible mount after 1934. The Leica Motor (a 1938 accessory) replaces the regular baseplate.*

Although neither the Leica nor the Contax were intrinsically synchronized for flash prior to 1950, Leitz made two prewar synchronization devices for the Leica. The earlier one functioned entirely externally. After cocking the shutter, a metal cap was placed in an appropriate manner over the main shutter speed dial. Another part of this synchronization device, placed in the camera's accessory clip, extended over the speed dial so that its contact point rested above a cut-out portion of the metal cap. (To prevent burned fingers, everything had to be correctly set before inserting a bulb.) When the shutter was tripped, the speed dial and cap rotated, making electrical contact to fire the flash. In 1939 Leitz introduced a special accessory Leica baseplate for simpler flash synchronization. Electrical contact occurred internally when a shutter shaft rotated.

Accessories for closeup and macro photography will be described in the concluding article.

*(Part II of this article will appear in the next issue.)*

# LICHTSTRAHLEN

***Light Rays: Notes of Interest to Those Interested in Zeiss and Its History***

## HOW OLD IS YOUR ZEISS PRODUCT?

A salient piece of information sought by collectors is the age of the item. With good shop records, this poses no great challenge. Zeiss collectors, mostly camera collectors, often become frustrated because the dating cannot be verified with any degree of accuracy or certainty. One reason is wartime destruction and the misplacement of records in the postwar chaos.

Another reason confirmed by the late Hubert Nerwin, an honorary member of Zeiss Historica, in the course of his talk at the Annual Meeting held in Rochester, New York, October 17-18, 1980 was that Zeiss Ikon did not follow any specific numbering system. Mr. Nerwin was the Director of the Design Department of Zeiss Ikon in Dresden from 1932-1945; then continued in that capacity at Zeiss Ikon, Stuttgart from 1945 until his retirement in 1949.

A brief summary of his remarks was reported in the Volume 3, Number 1, Spring 1981 issue of Zeiss Historica Journal. "Mr. Nerwin was never aware of any 'system' in assigning serial numbers to camera bodies in general at the Zeiss Ikon, Dresden works. When a batch of cameras was ordered, the warehouse stockman (Christian Steinmetz was in charge of the warehouse) assigned a batch number, without any system being presently known."

There are a number of instruments produced by Carl Zeiss, Jena where dating is self-evident because the manufacturing date was factory engraved on the instrument. How and why these instruments were chosen for dating is not known to this author. Figure 1 shows a Zeiss Theodolite Nr. 147707 marked Theod. Art 2, the Zeiss logo, M.G. 1939 No. 0046 and the coat of arms of Brazil. Before jumping to a hasty conclusion, see figure 2 depicting a Zeiss Surveying Level, Model Ni B, Nr. 73256, engraved with the Zeiss logo and the date 1944. Microscope stand, L, Nr. 298175 is dated 1943 and is illustrated in figure 3. The Hand Sugar Refractometer Nr. 101112 that displays the 1944 date below the Zeiss logo is shown in figure 4.

If any of our readers has further information, please send it to our Editor for dissemination. *From Nicholas Grossman.*

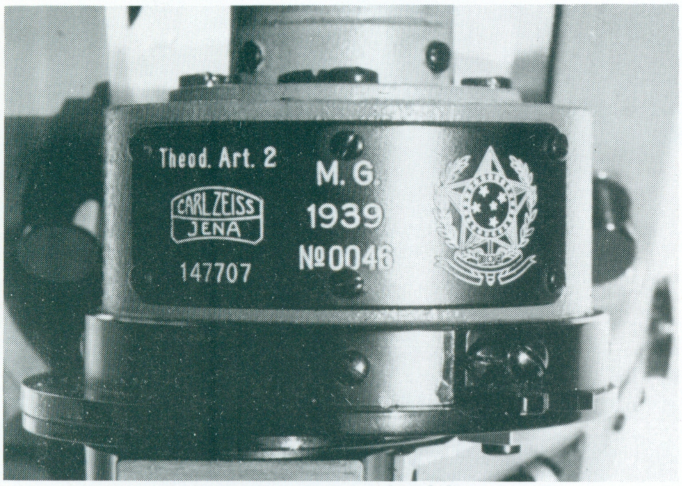



*Figure 1. Zeiss theodolite.*


*Figure 2. Zeiss surveying level.*


*Figure 3. Zeiss microscope stand.*


*Figure 4. Zeiss hand sugar refractometer.*

"What ! Another Zeiss Ikon Miniature ?"

"Yes : They've just brought out the Nettax."

"H'm ! Looks quite an exquisite job. And I see that you can interchange the lenses."

"Yes : Besides the two Zeiss Tessars of 2″ focal length as standard lenses you can use a long focus Triotar for distance work and a wide angle Tessar."

"But what's that at the bottom of the lens ?"

"That's the mount holding the wedges. The rotating wedge distance meter is combined with the lens on the Nettax, and the lenses are interchanged in the same way as with the Contax and the Contaflex, by the reliable bayonet mount."

"But isn't it, like most miniatures, expensive ?"

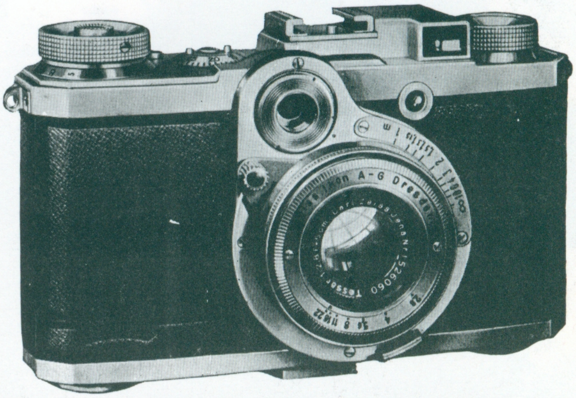
"No : On the contrary for a high-class precision instrument it is moderately priced—actually **£11 : 5 : 0,** cheaper than the Contax II., but nothing has been sacrificed to efficiency or quality. Zeiss Ikon will see to that."

ZEISS IKON

# NETTAX

The Nettax is indeed a fine 24 × 36 mm. camera, and it provides in addition to the above an all-metal focal plane shutter speeded from 1/5th to 1/1000th second, and a detachable back facilitates cleaning and permits the use of plates. The Nettax takes the well-known Contax spools—as easy to load as the ordinary roll film—or any of the systems used for 24 × 36 mm. cameras.

*Ask your local dealer to demonstrate the Nettax. Name of nearest stockist, together with new publication "Unfettered Photography" post free on request.*



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