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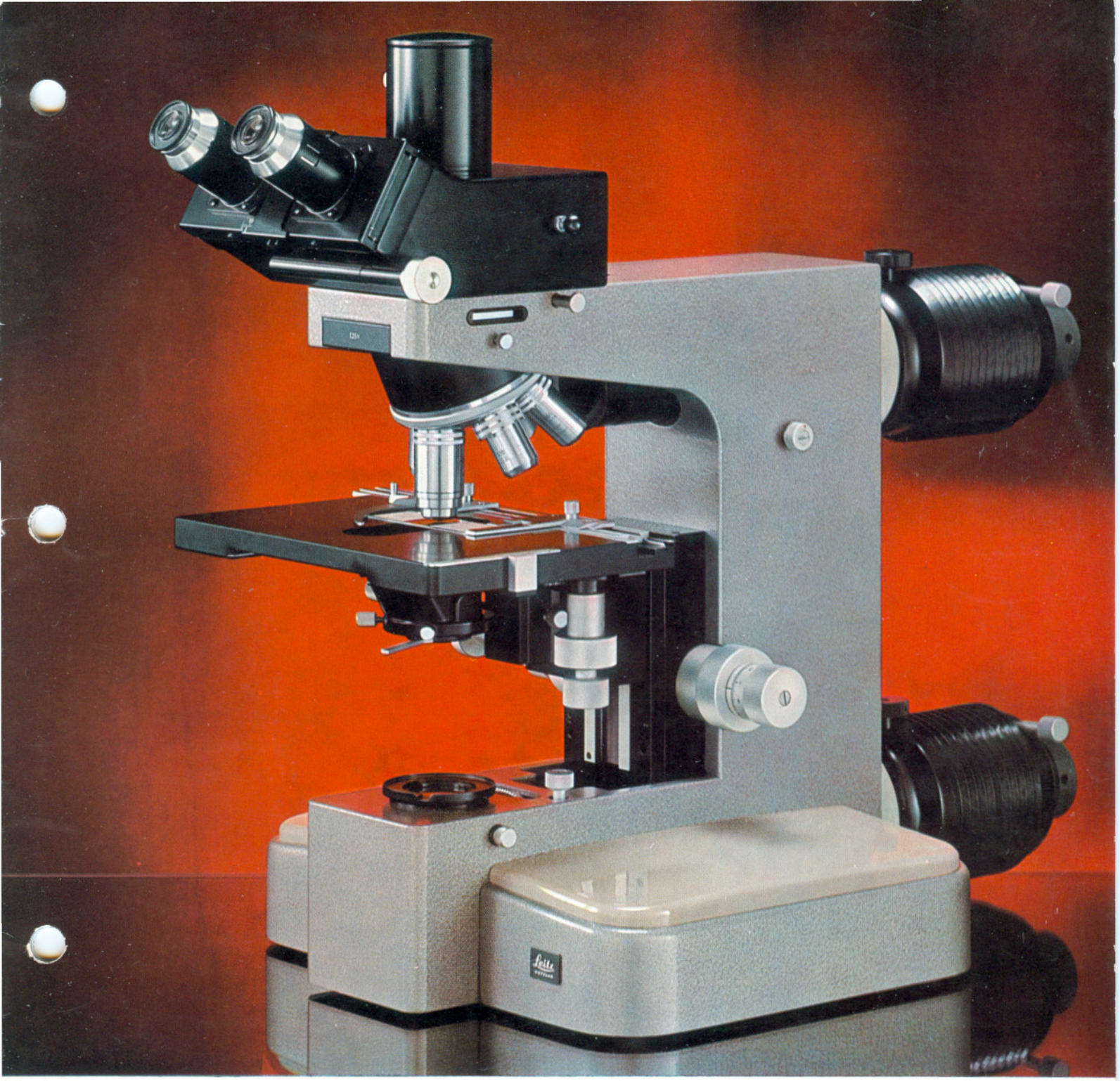
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ORTHOPLAN

with 30mm wide field eyepieces.

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Plano-Large-Field Research Microscope ORTHOPLAN

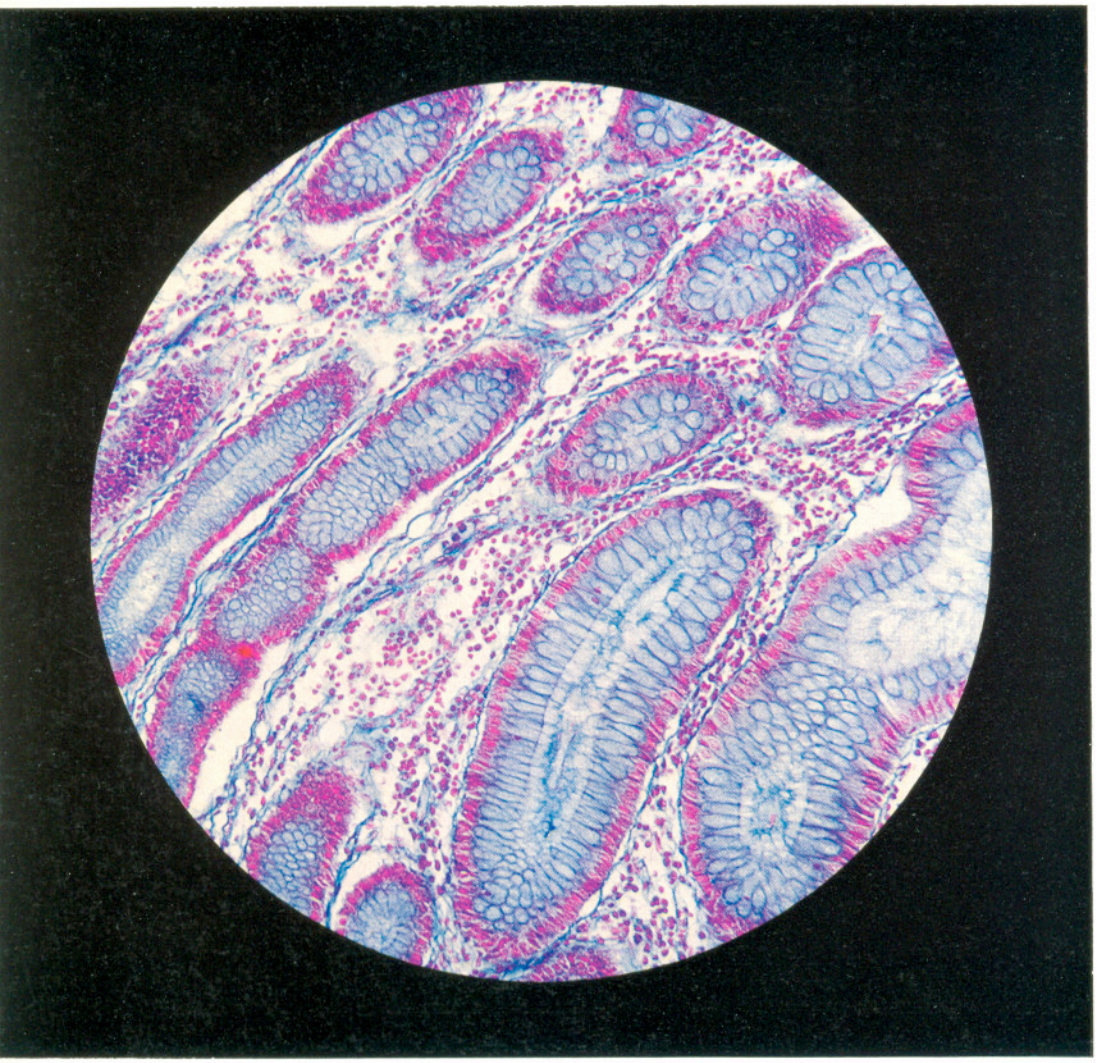
The ORTHOPLAN® is a new member of the family of Leitz Research Microscopes. It is the first instrument designed for a field of view of 28 mm. Optical performance together with the versatility of its design place it in the front rank of our production.

A feature characteristic of the ORTHOPLAN microscope is the enlarged trinocular body for widefield eyepieces of 30 mm diameter, which for the first time realizes the full potentialities of our plano objectives in a biological microscope. The field of view of the ORTHOPLAN is up to more than twice as large as that of a conventional microscope and is completely flat without marginal unsharpness. The resulting gain of information may be a decisive factor not only in research, but also in many routine investigations.

The ORTHOPLAN offers in addition the wide range of facilities of the LEITZ unit system for scientific microscopy. This includes not only accessories for all the classical and modern methods of microscopy in transmitted and incident light, but also gas discharge lamps of up to 500 watt, all available spectral lamps and an integral camera carrier for large-format camera 4 x 5″ with adapter for the POLAROID LAND system. The economic advantages of the 35 mm photography can be realized by our micro attachments and the ORTHOMAT fully automatic microscope camera.

Further hints are given in the following pages of this list.

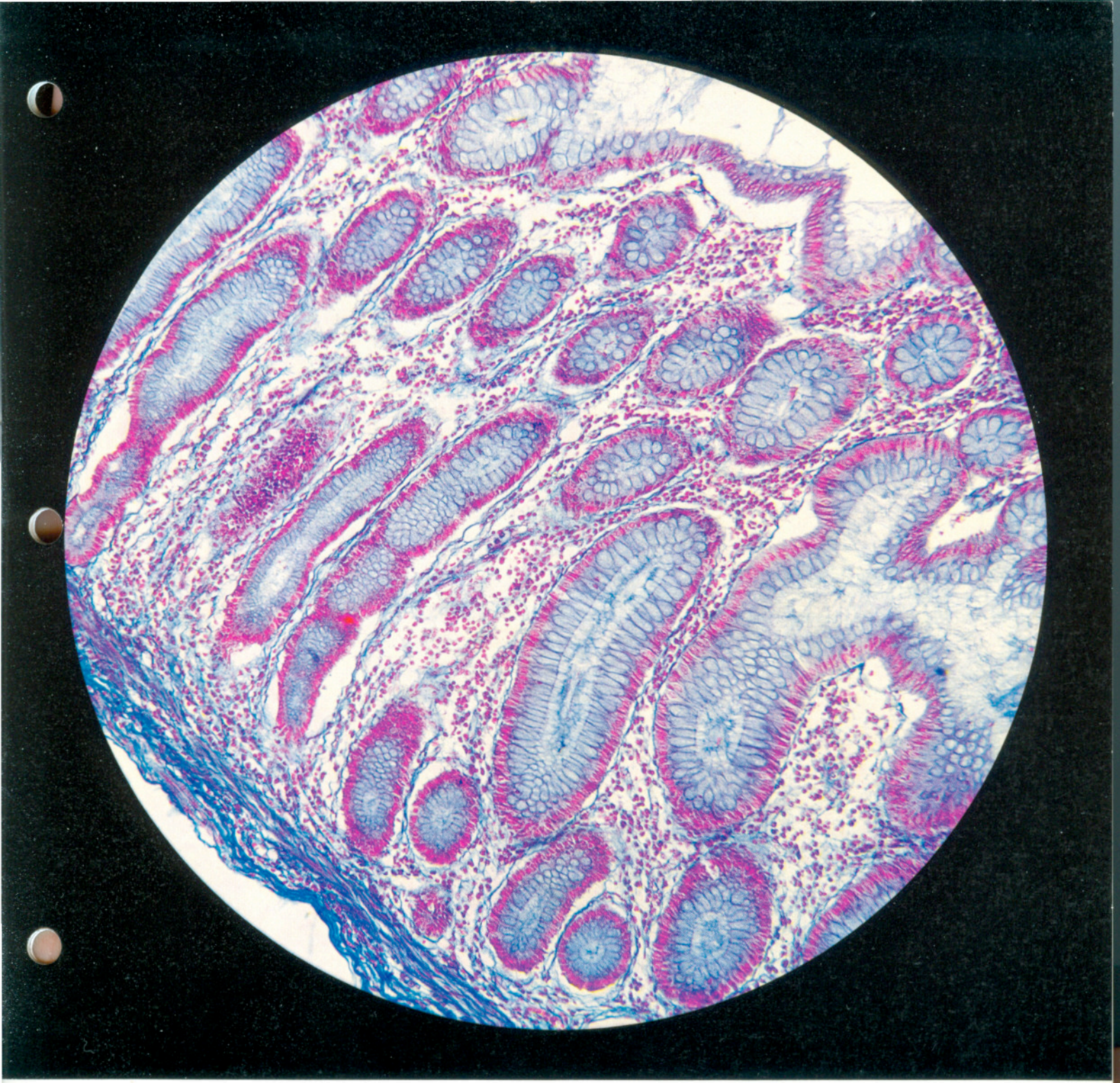

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Microscope section by
Johannes Lieder,
Laboratory for
Microscopy, Ludwigsburg

Field of view in a conventional microscope–

The picture on the left shows a histological section as seen in a conventional microscope with 6.3x PERIPLAN® eyepiece, field-of-view index 18, and 25/0.50 plano objective. To the observer the field of view appears at a diameter of **113mm.** However, eyepiece of field-of-view indices of up to 18 do not fully utilize our plano objectives.



and in the ORTHOPLAN

The decisive step of fully exploiting the high field performance of the plano objectives was taken with the introduction of our GW eyepieces. However, this required a stand whose optical and mechanical design permits the use of eyepieces of 30mm diameter.
The picture on the right shows the same histological section seen in the ORTHOPLAN microscope with PERIPLAN GW 6.3x widefield eyepiece, field-of-view index 28, and 25/0.50 plano objective. To the observer the field of view appears at a diameter of **176mm.**

Larger field of view – more information

The smallness of the field of view of a conventional microscope is apparent to any microscopist scanning extensive sections. The demand for larger fields of view will be immediately evident when we compare the area surveyed by a 40x objective with the "classical" 10x eyepiece, e.g. with that of a smear preparation. Our PERIPLAN® GF widefield eyepieces (23.2mm diameter) represented a first step in this direction. For a better understanding of the problem involved it is necessary at this point to explain the function of the eyepiece in the microscope: it represents a magnifying glass with which the intermediate image formed by the objective is viewed. The extent of the visible area of this intermediate image depends on the field-of-view index* of the eyepiece. Since the field-of-view indices of PERIPLAN GF widefield eyepieces are considerably larger than those of ordinary PERIPLAN eyepieces, it is possible to survey with them a larger area of the intermediate image and obviously also of the object. This real gain in information is the most notable advantage of the GF eyepieces, used in all large LEITZ stands since 1954.

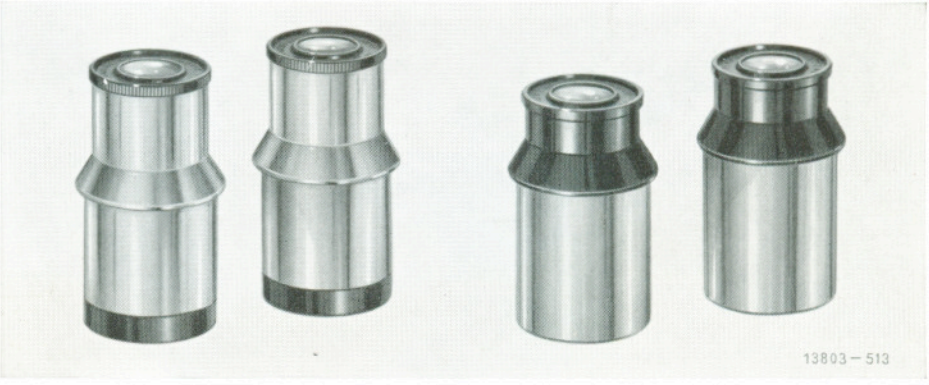
* **The field-of-view index represents the diameter in mm of the intermediate image visible with the eyepiece.**

Widefield optical system on the ORTHOPLAN

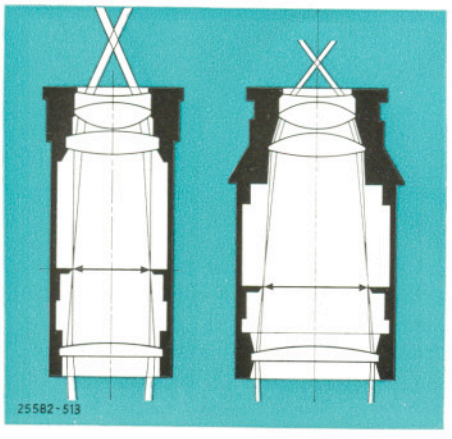
1) LEITZ widefield eyepieces, 30mm diameter.

A further appreciable increase of the field-of-view indices is possible only by introducing larger tubes with eyepieces to match. This has been done for the first time in a biological stand in our ORTHOPLAN large microscope whose wide tube accepts GW and GG eyepieces of field-of-view indices of up to 28.

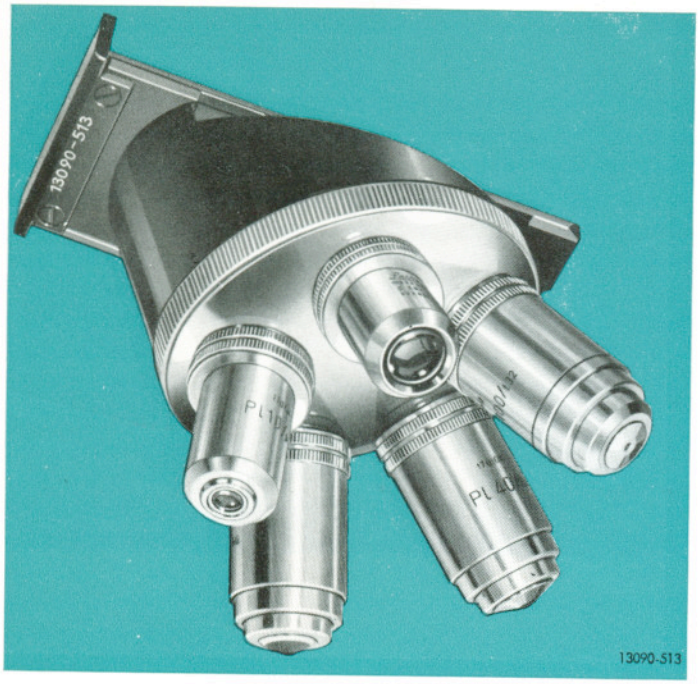
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Top — Paired eyepieces, 30mm diameter. On the left GW 6.3x (field-of-view index 28), on the right GF 10x (field-of-view index 18). with adapter for large diameter.



Cross section and beam path, on the left in the GF eyepiece, on the right in the GW eyepiece. It is readily seen that the GW type accommodates a considerably larger intermediate image (indicated in the diagram by an arrow).



Revolving nosepiece with 5 plano objectives: Pl FI 4/0.14
Pl FI 10/0.30
Pl 25/0.50
Pl 40/0.65
Pl Apo OI 100/1.32
1x tube lens invisible inside the nosepiece.

2) LEITZ plano objectives

However, it is by no means enough to increase the field-of-view index of the eyepieces, unless the correction of the objectives is correspondingly improved. The field curvature from which conventional types of objective suffer would result in unsharp marginal zones without fail when combined with GW or GG eyepieces, almost cancelling the advantage of a large field of view.

Hence objectives have to be used which are free from field curvature throughout the enlarged field of view, a requirement which is met by the LEITZ plano objectives. The excellent field performance of these objectives, which are corrected for field-of-view indices of up to 28, could never be fully exploited until the introduction of the new eyepieces. A look through the eyepieces of the ORTHOPLAN reveals a surprisingly large, chromatically pure image without any marginal falling off of sharpness. A series of 5 plano objectives of systematically spaced magnifications from 4x to 100x, with a colour correction increasing appropriately from achromatic to apochromatic is available for transmitted-light microscopy. Their definition, contrast, and resolving power meet the demands even of delicate research projects.

Special objectives are supplied for special purposes such as phase contrast microscopy, incident-light examinations etc. The table on the right below contains detailed information.

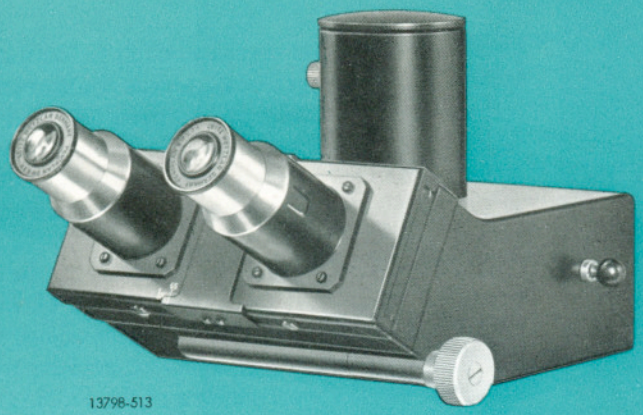
Designation	Magnification / Aperture	Focal length mm	Free working distance mm
Plano objectives	Pl FI 4/0.14	39.7	14.4
	Pl FI 10/0.30	17.8	7.05
	Pl 25/0.50	7.6	0.90
	Pl 40/0.65	4.6	0.58
	Pl Apo OI 100/1.32	2.4	0.27

All plano objectives are parfocal on the revolving nosepiece.

PERIPLAN GW/GG widefield eyepieces		PERIPLAN GF widefield eyepiece	
Designation	Field of view index	Designation	Field of view index
GW 6.3x	**28**	GF 10x	18
GG 8x M	**24**	GF 10x M	18
GW 10	**24**	Graticule 10mm=100 intervals	
The GG 8x M is included in the basic outfit (suitable for the insertion of graticules).		GF 16x	15
		GF 25x	10
		GF 25x M	10
		Graticule 10mm=100 intervals	

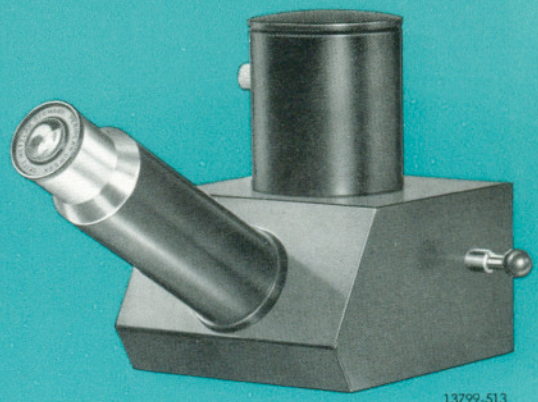
Method of investigation	Recommended eyepieces and objectives	Preferably for revolving nosepiece with tube lens
Transmitted-light bright-field	Plano objectives and GW- or GG eyepieces	1x
Transmitted-light dark-field	Standard objectives or special objectives with iris diaphragm etc. and GF eyepieces	1.25x
Fluorescence	Generally standard objectives and GF eyepieces	1.25x
Phase contrast and phase contrast fluorescence	Special phase contrast objectives and GF eyepieces	1.25x
Incident-light darkfield with ULTROPAK	Special UO objectives and GF eyepieces	Intermediate image system 1.25x with ULTROPAK
Orientating investigations in polarized transmitted light	Plano objectives and GW or GG eyepieces	1x

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13798-513

FSA-GW binocular tube for eyepieces of 30mm diameter



13799-513

FP-GW monocular tube for eyepieces of 30mm diameter

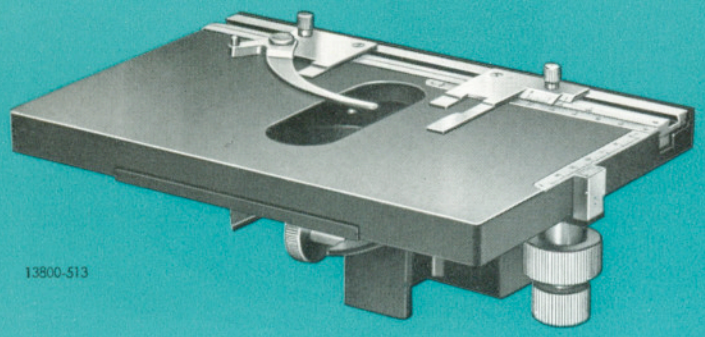
Technical description

Stand

The foot of the compact stand is supported by four dampers protecting the instrument against external vibrations. Two large hand rests accommodate the hands within easy reach of the fine focusing and stage adjustments. The illuminating system with field diaphragm for Köhler's illumination is built into the foot of the stand. The completely dustproof coarse- and fine focusing mechanism is coaxially arranged and actuates the object stage. It operates through an epicyclic gear and is absolutely free from play. **The long adjustment range of the fine focusing is remarkable; it is 40mm** and elimited by stops.
This avoids a frequent change between coarse- and fine focusing. 1 scale division on the fine focusing control corresponds to 1 μ. A slide which accommodates filters of 25mm diameter is located immediately below the tube changer. The various filter positions are determined by click stops.
It need not be emphasized that the mechanical and optical components of the instrument, such as tubes, nosepieces, stages and illuminators, are interchangeable, and can be used in any desired combination.

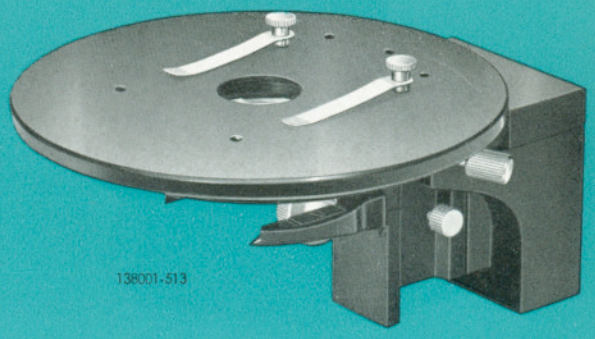
Widefield binocular tube

The standard version of the microscope is upplied with the FSA- GW tube for widefield eyepieces of 30mm diameter; this is a combination of binocular observation- and phototube; another notable feature is its mechanical tube length compensation which ensure parfocality of the film plan in the 35mm camera and the image in the eyepiece for any interpupillary distance. This is also very convenient if the stand is used for cinematography or for television microscopy.
The optical system of the tube incorporates a beam splitter which deflects 20% of the total light into the eyepiece tubes; special interference films divide it without loss into equal parts for each eyepiece tube; 80% pass through the photo tube. Observation is also possible at full light intensity by disengaging the beam splitter.



13800-513

Large mechanical stage No 660



138001-513

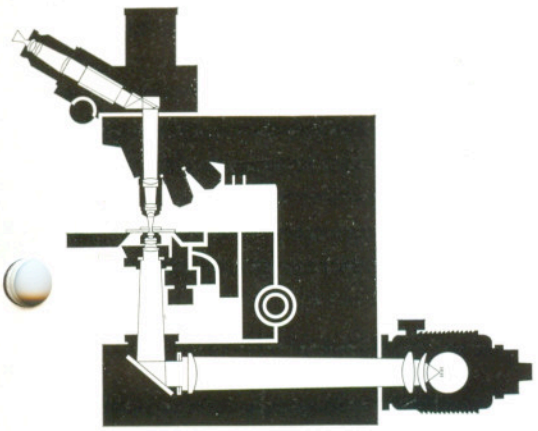
Object stage No 763

Object stages

Two interchangeable object stages are available: The square mechanical stage No. 660, 210 x 150mm, traversing range 76 x 50mm, and the object stage No. 763, diameter 150mm.

Normally the ORTHOPLAN is supplied with the square mechanical stage. Its low-set controls are situated on the right and operated in comfort with the hand supported by the plastic base of the microscope. This permits effortless and reliable scanning even of extensive preparations. The setting of the mechanical stage can be read off verniers to an accuracy of 0.1mm. The specimen guides can be removed, so that for special examinations the entire area of the stage becomes available.

For certain purposes the ORTHOPLAN can also be fitted with the circular object stage No 763, diameter 150mm. This object stage slides in a centring support which has two setting screws to permit orientation of the object within a limited adjustment range. If necessary the stage can be easily removed from the support which can then be used for other purposes such as microscopical examinations with the Heating Stage 80. It is recommended to supplement the circular object stage with the attachable mechanical stage No 43.

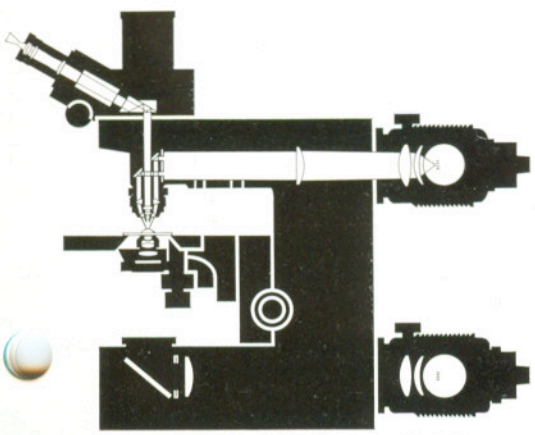


25583-512

Revolving nosepieces

The quintuple nosepiece slides out horizontally and is interchangeable, e. g. with the ULTROPAK® or other optical systems. It moves on ball bearings and has click stops to ensure accurate maintenance of the image centre after each change of magnification.

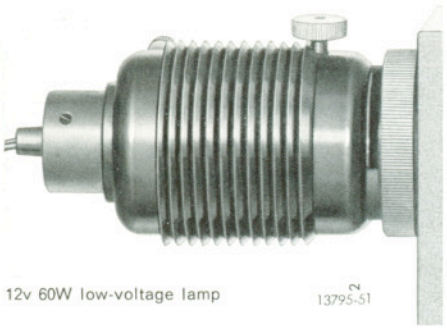
The nosepiece is available with 1x or 1.25x tube lens. Plano objectives should be used with the 1x tube lens, which fully utilizes the field of view. For special methods such as phase contrast, the use of a second nosepiece with the 1.25x tube lens is recommended. See also the table on p. 7.



25584-513

Top: Beam path, transmitted light

Bottom: Beam path, incident light



12v 60W low-voltage lamp 13795-51

Low-voltage lamp

The basic outfit of the ORTHOPLAN includes one or two attachable, permanently centred 12v 60W low-voltage lamps for transmitted and incident light. They have special flat coils which emit a very bright light of colour temperatures from 2800° to 3400° K; they meet all requirements of visual observation in transmitted and incident light.

Lamp housing 250

The lamp housing 250 with mirror housing 250 is used for examinations with gas discharge lamps of up to 250W. This enables the microscopist to work alternatively with the 12v 60W low-voltage lamp or the powerful high-pressure mercury and high-pressure xenon lamps. By means of a beam splitter built into the mirror housing mixed light consisting of 90% U.V. — or blue light and a variable proportion of halfwatt light can be produced for phase-contrast fluorescence.
The lamp housing 250 is suitable for all investigations in transmitted- and incident light. Like the low-voltage lamp it is simply secured in the lower or upper aperture of the stand. Our list 512-72 contains detailed information.

Lamp housing 500

Our lamp housing 500, at present at the design stage, offers the further possibility of using gas discharge lamps of up to 500W in addition to the 12v 60W low-voltage lamp. A hinged mirror is provided so that each of these lamps can be used for transmitted and incident light. Combined illumination by transmitted-light gas discharge lamps + incident-light halfwatt lamps and vice versa, as well as mixed light consisting of U.V. and halfwatt light for phase contrast fluorescence microscopy is also possible. In addition to gas discharge lamps, the most varied spectral lamps can of course also be used, merely by exchanging the lamp and its fittings. The collector lens of the lamp housing transmits long-wave U.V. light.

12637-513



Condenser No 602 and condenser top No 003. The tops are interchangeable.

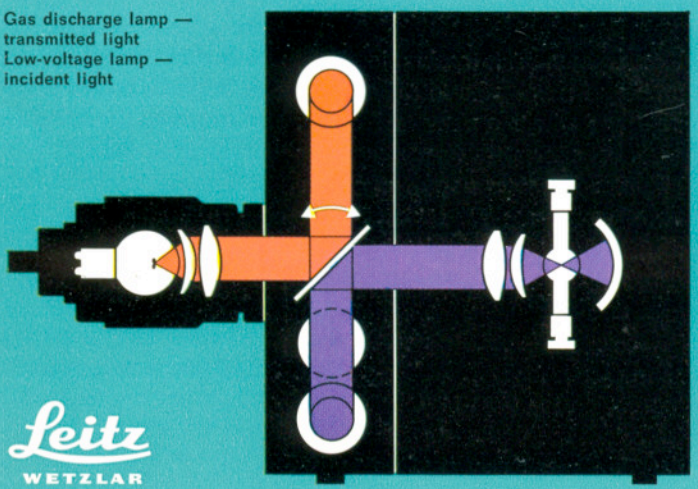
Condensers for transmitted-light brightfield

Since most of the objectives used in the ORTHOPLAN are highly corrected, the standard outfit includes the achromatic swingout condenser No 602, whose spherical and chromatic correction is good enough to permit the use of all Leitz objectives, including the LEITZ plano objectives. The condenser has an aperture of 0.90, which is sufficient to illuminate the aperture of practically all dry objectives. Immersion objectives, too, can be used with this condenser; only if the resolution of the most minute structures is essential will a condenser of an aperture larger than 0.90 become necessary.
For this purpose the condenser top No 002, A. 0.90, can be easily replaced by the to No 003, which converts the condenser into the achromatic-aplanatic version A 1.25 (No 603), used mainly with oil immersion apochromats and in colour photomicrography at large field apertures. Its spherical and chromatic correction, light utilization, and precision of focusing in the field of view are outstanding.

ORTHOPLAN with lamp housing 500

Various possibilities of illumination:

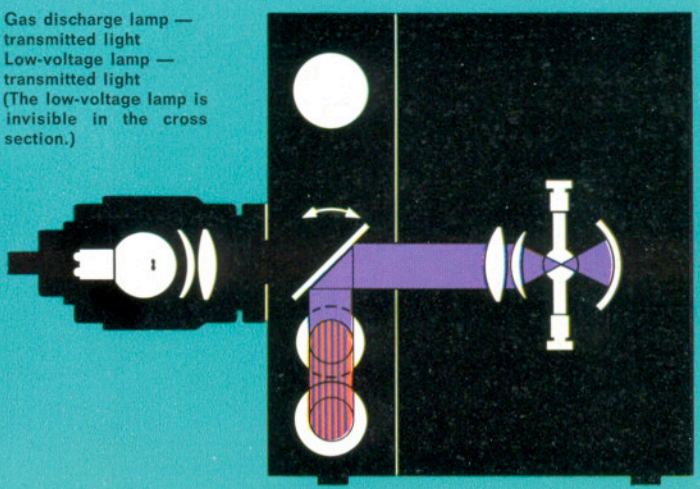
Gas discharge lamp — transmitted light
Low-voltage lamp — incident light



25585-513

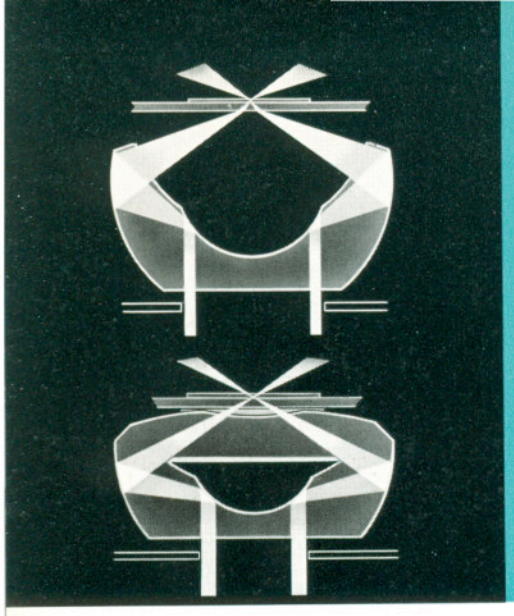
Beam path in phase contrast-fluorescence:

Gas discharge lamp — transmitted light
Low-voltage lamp — transmitted light
(The low-voltage lamp is invisible in the cross section.)



25586-513

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5864c - 513



10170 - 513

Condensers for darkfield

Dry darkfield condenser D 0.80, A 0.80 (internal limiting aperture)

For serial investigations and orientating scanning with medium- and high-power dry systems

Immersion darkfield condenser D 1.20, A 1.20 (internal limiting aperture)

For high magnifications, mainly with oil immersion objectives. Standard equipment for clinical and bacteriological examinations.

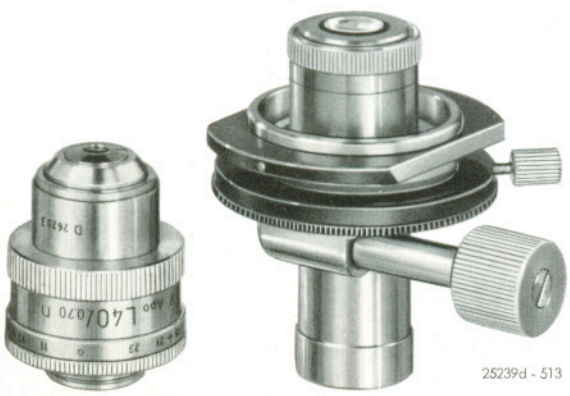
Special outfits

Transmitted-light darkfield

Oberservations in transmitted-light darkfield will be generally of interest to the biologist and the medical worker. The only requirement here is a darkfield condenser for dry or for oil immersion objectives. Provided the internal aperture of the darkfield condenser is larger than that of the objectives special objectives will not be necessary; otherwise objectives with funnel stops or a built-in iris diaphragm must be used.

Transmitted polarized light

For orientating investigations in transmitted polarized light two filter polarizers are supplied. The analyser is placed in the filter slide in the stand, and the polarizer attached to the bottom part of the condenser No 602.



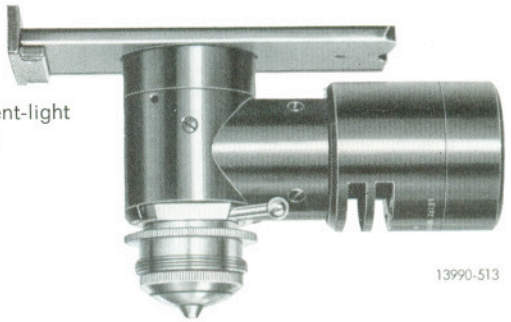
25239d - 513

Heine condenser with Pv Apo L 40/0.70 objective

Incident-light darkfield

For incident-light darkfield microscopy our ULTROPAK® incident-light illuminator is recommended; it is simple to operate and produces clear and brilliant images. It consists of the housing with a permanently fixed ring mirror, and the interchangeable UO objectives of 4x-75x primary magnification. The built-in illuminator of the ORTHOPLAN or the lamp housing 250 serves as the light source.
Special illuminators for incident-light investigations in bright field of metals etc., or in polarized light of minerals and ores are being designed.

ULTROPAK incident-light illuminator for the ORTHOPLAN



13990-513

Phase contrast with Heine condenser

This equipment is recommended for the examination of extremely thin objects in phase contrast, brightfield and darkfield and where a continuous transition between these types of illumination with uninterrupted observation is desired.
The simultaneous use of brightfield and phase contrast can be of advantage for objects containing both amplitude- and phase structures, such as histological sections, fine-grain dressing products, dust samples with absorbing or opaque particles etc.
The equipment consists of: —
Heine condenser No 64, aperture 0.25-0.70; with screw-on immersion top 0.50-1.40.
Selection of Pv phase contrast objectives
Auxiliary magnifier (auxiliary microscope).

Phase contrast after Zernike

With this equipment objects can be examined in phase contrast, brightfield, and darkfield. Each objective requires a corresponding position of the annular stop turret in the condenser; the changeover to the appropriate annular stop setting will therefore always produce perfectly adjusted illumination. The conditions are easy to control and reproducible at any time. The object is seen either in phase contrast, brightfield, or darkfield. In brightfield the full field aperture of the condenser is utilized. In comparative investigations in brightfield which often reveal further information about the fine structure of the object advantage can therefore be taken of the full resolving power of the objectives, without appreciable effect of the phase ring.
The equipment includes
Achromatic phase contrast condenser No 402a or 402b
Objectives Phaco 10/0.25, 40/0.65, OI 100/1.30
Auxiliary magnifier (auxiliary microscope).



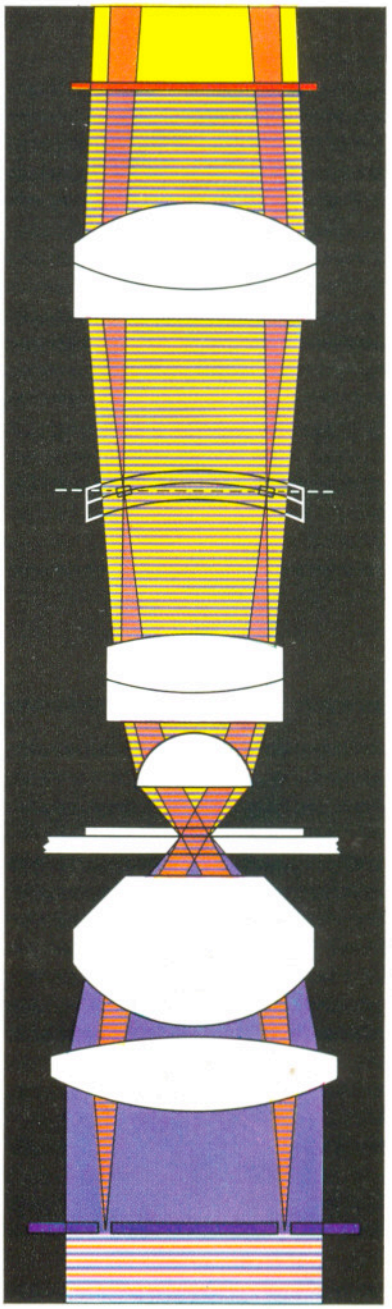
Phase contrast condenser after Zernike with an achromatic objective.

Fluorescence

Unlike the conventional methods of microscopy which are based on the light transmitted or reflected by the object, fluorescence microscopy involves the observation of preparations which emit light of their own either in form of specific primary radiation or as secondary emission induced by fluorochroming. The radiation-exciting primary fluorescence, usually u. v. radiation, does not contribute towards image formation. It is absorbed by suppression filters. The fluorescent portions therefore appear bright on a dark background. Brightfield or darkfield condensers of the largest possible aperture are used in conventional fluorescence microscopy for exciting radiation.
The following items are necessary: —
ORTHOPLAN microscope with lamp housing 500 or 250 and highpressure mercury lamp.
Selection of objectives (achromats, or, where necessary, apochromats) and eyepieces
Transmitting and absorbing filters
Condensers of large aperture for brightfield or darkfield.
See also List 52-20.

Phase-contrast fluorescence

The phase-contrast fluorescence technique combines the advantages of phase contrast with those of fluorescence. A phase contrast image is superimposed on the fluorescence image to make the two images, whose colours are usually well differentiated, appear simultaneously in the microscope. This combination calls for a mixture of ultra-violet or blue radiation with halfwatt light in the illuminating system of the microscope. The lamp housing 500 meets this requirement in a simple manner. By means of a built-in beam splitter mixed light consisting of the exciting radiation and a variable proportion of halfwatt light can be produced, which is used for the excitation of fluorescence and the representation of non-fluorescent portions in phase contrast respectively.
Items required: —
ORTHOPLAN microscope with lamp housing 250 or 500 and high-pressure mercury lamp.
Phaco objectives for the Zernike equipment.
Zernike phasecontrast-fluorescence condenser.
Transmitting and absorbing filters
for U.V. or blue fluorescence exciting radiation.


25587 - 52

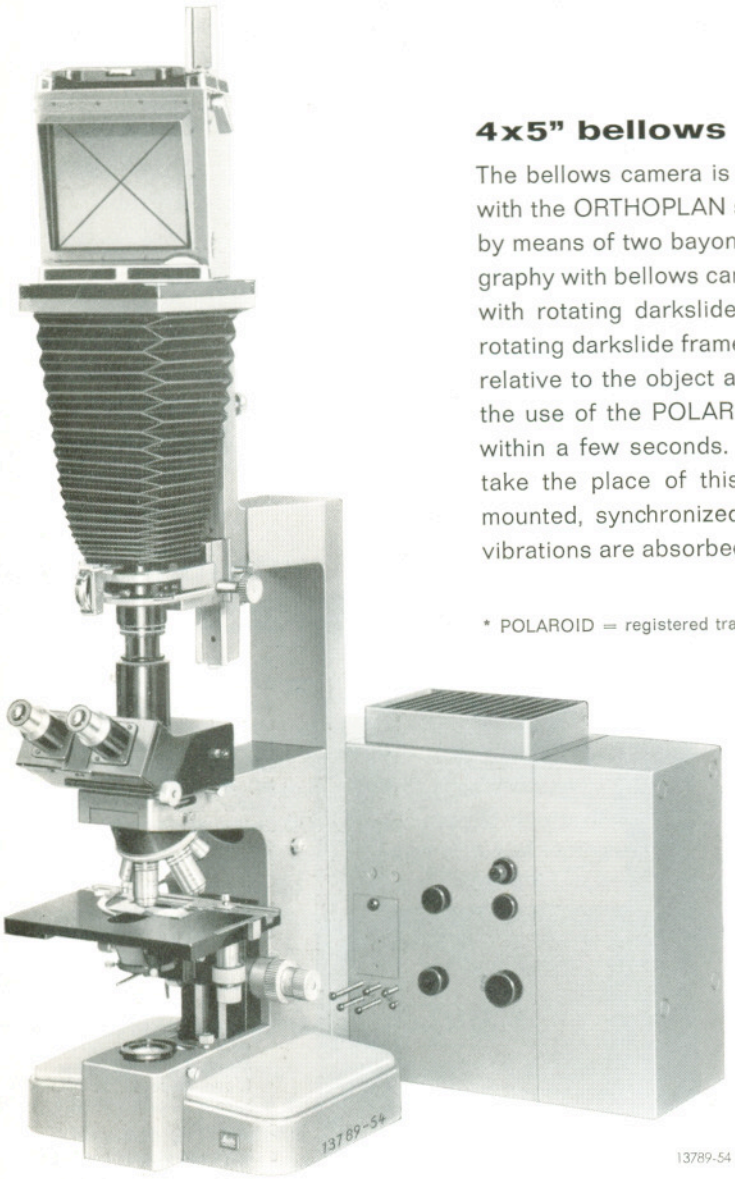
Beam path
Phase contrast fluorescence

The light sources for U.V. (for fluorescence) and for halfwatt light (for phase contrast) are respectively built into, and attached to the lamp housing. The special transmitting filter (violet) is inserted below the condenser, and the absorbing filter (red) in the filter slide above the objective.

Colour symbols:

1 Pure fluorescent light
2 Pure phase contrast light
3 Fluorescent light + U.V.
4 Halfwatt light (phase contrast) + U.V.
A small amount of fluorescent light will be present below the object plane; it can, however, be ignored here.
5 U.V.
6 U.V. and visible portion of Hg light + halfwatt light

Photomicrography



13789-54

ORTHOPLAN with 4 x 5" bellows camera and lamp house 500.

4x5" bellows camera

The bellows camera is directly mounted on a holder (with prismatic bar) supplied with the ORTHOPLAN stand. The holder is attached to the back of the microscope by means of two bayonet fittings. It is extremely rigid and suitable for photomicrography with bellows cameras of up to 9 x 12cm and 4 x 5". The 4 x 5" bellows camera with rotating darkslide frame and international back is generally preferred. The rotating darkslide frame permits orientation of the darkslide in any desired position relative to the object and thus full utilization of the film area. In addition it makes the use of the POLAROID* LAND method possible, producing final paper prints within a few seconds. A 9 x 12cm bellows camera with mirror reflex housing can take the place of this equipment. Both cameras incorporate an anti-vibration-mounted, synchronized time- and instantaneous shutter. Any disturbing external vibrations are absorbed by the elastic support of the stand.

* POLAROID = registered trademark of Polaroid Corp. Cambridge, Mass. U.S.A.

ORTHOMAT® fully automatic microscope camera

This attachment, consisting of camera and control unit, converts the ORTHOPLAN into a fully automatic camera microscope for 35mm photography. Its operation is of the utmost simplicity: —

All you have to do is to press a button. Immediately after the exposure the camera is ready for the next picture.

In spite of complete automation the exposure latitude in darkfield or phase contrast is practically unlimited; it covers all the tasks likely to be met with in photomicrography, from the long time exposure of fluorescing objects to that of living specimens at $^1/_{100}$ sec. or with electronic flash.

The possibility of adapting the exposure control to the characteristics of the specimen is of particular advantage; in darkfield objects, for instance, or preparations taking up only a small proportion of the field of view, the film can thus be exposed for pictorially important features. Further details are contained in List 54-20.

Micro attachment for the LEICA®
with vibration dampers

The newly developed micro attachment for the LEICA offers the microscopist the versatile technical possibilities and economic advantages of 35mm photography. A number of technical innovations adds to the convenience of operation, saves time and extends the range of applications compared with earlier models of micro attachments.

The most important new feature is the vibration damper built into the upper part of the attachment which insulates the microscope from the unavoidable shutter vibration of the camera. It has thus become possible for the first time to obtain perfectly sharp pictures even with oil immersion objectives and short exposure times in an attachment camera without special stand.

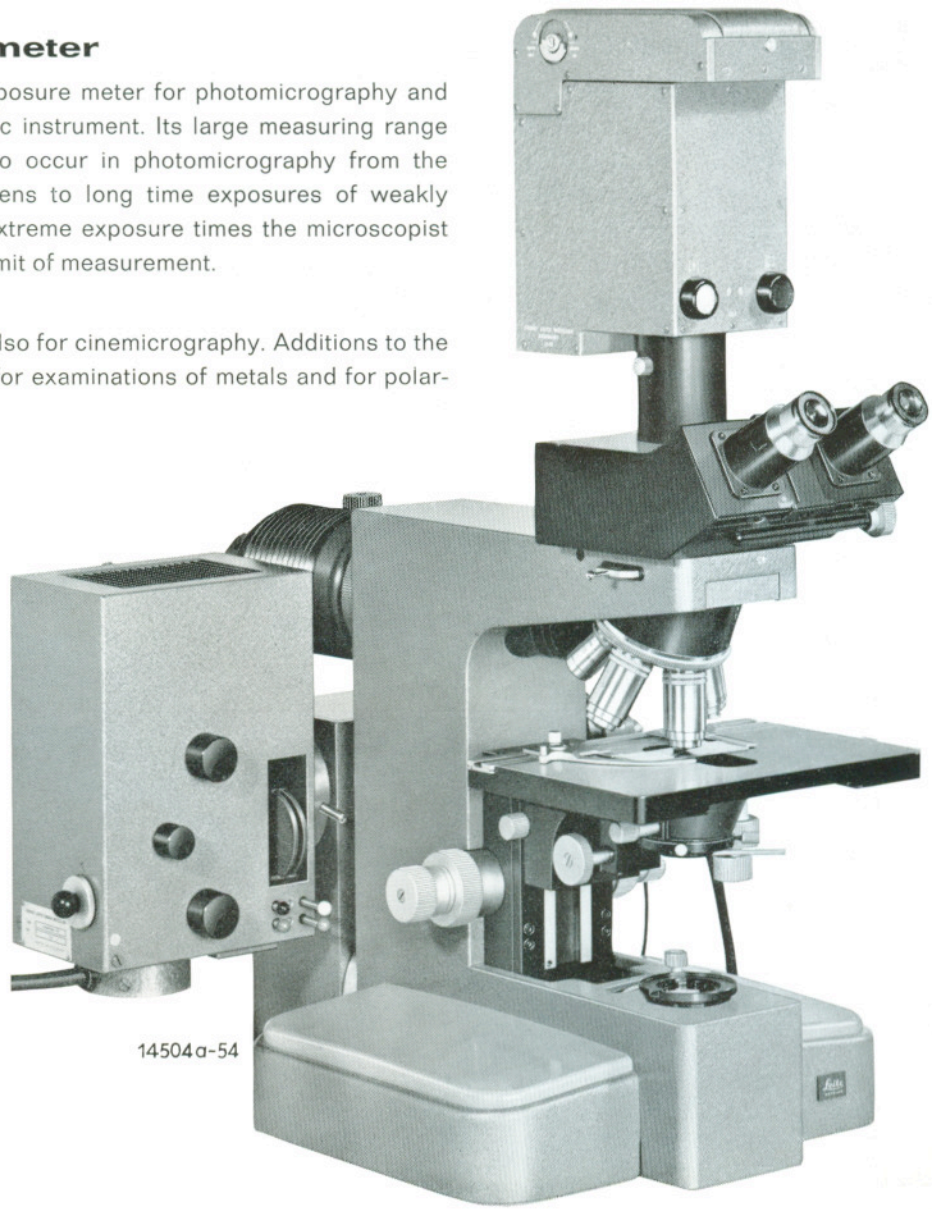
An obvious step further is the combination of the micro attachment for the LEICA with the new MICROSIX-L exposure meter; it simplifies the determination of the exposure time considerably. By moving a lever on the micro attachment the full light beam is directed into the measuring eye of the MICROSIX-L, which can remain permanently connected with the micro attachment. The measuring value is read off the exposure meter scale at a glance and the correct exposure time determined within a few seconds. It is a notable feature of the instrument that the exposure time is measured on small object details which largely eliminates the effect of the surrounding field. These and other advantages are fully described in List 54-22.

MICROSIX®-L exposure meter

The MICROSIX-L is a highly sensitive exposure meter for photomicrography and suitable for any type of photomicrographic instrument. Its large measuring range easily covers all exposure times likely to occur in photomicrography from the instantaneous exposure of living specimens to long time exposures of weakly fluorescing objects. Even with the most extreme exposure times the microscopist will hardly ever reach the upper or lower limit of measurement.

For detailed description see List 54-22.

The ORTHOPLAN can of course be used also for cinemicrography. Additions to the range of accessories are being designed for examinations of metals and for polarized-light microscopy.



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ORTHOPLAN with fully automatic microscope camera ORTHOMAT and lamp housing 250.



® = registered trademark

Design subject to alterations without notice.

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