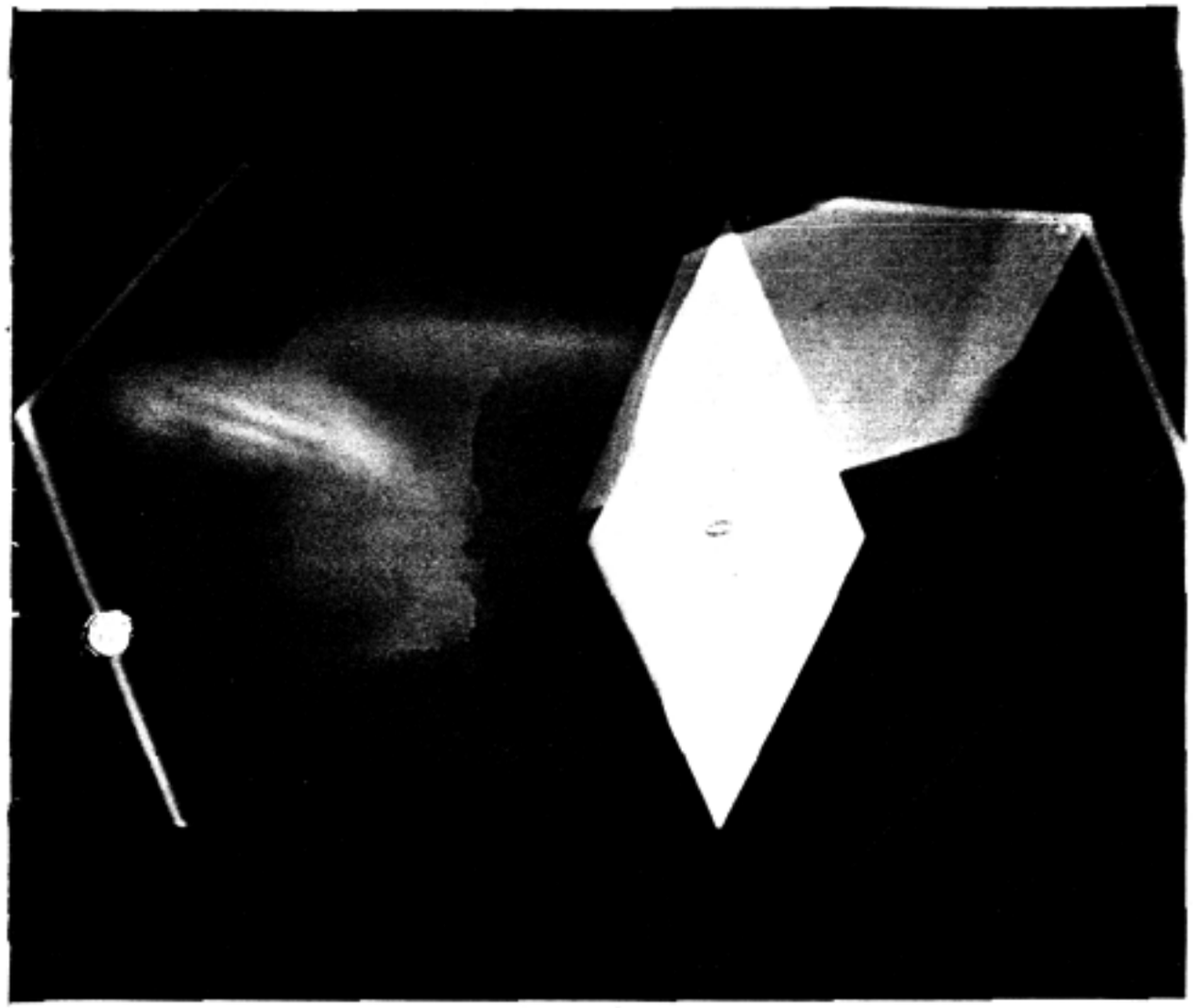
Polarising Microscope

Wild M21



WILD
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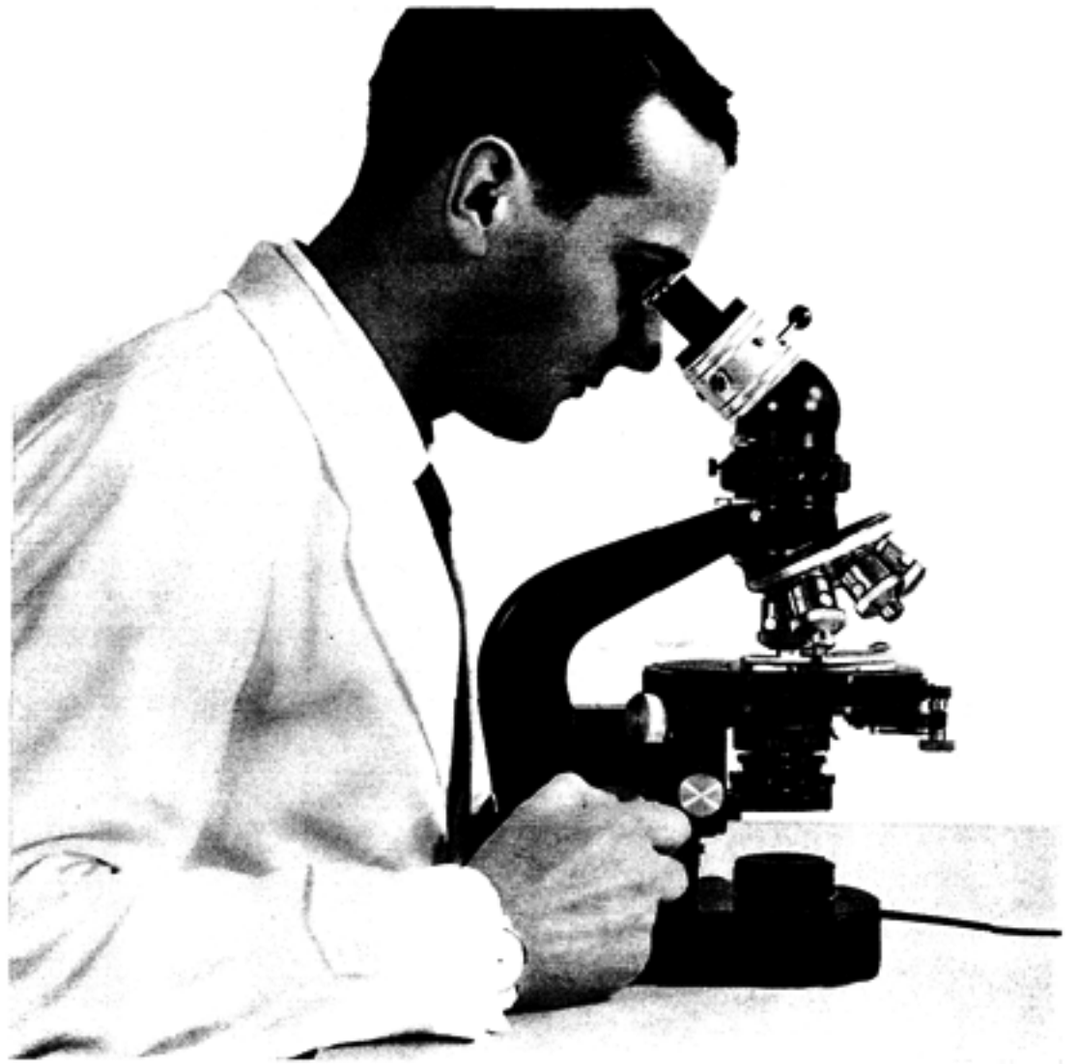
Polarising Microscope Wild M21

The polarising microscope is of fundamental importance in geology, and its applications in *mineralogy, crystallography, petrography and* alaeontology have long been widely appre-iated. It is less well-known however, that the olarising microscope can also be used with onsiderable success in many other branches *f natural science. It can simplify and improve* bservation and reveal much new information hich is unobtainable by other means.

biology the polarising microscope was in se before staining techniques were devel-ped. Since natural birefringence often ccurs in biological material the polarising *microscope can be employed not only for the* recognition and identification of crystallir inclusions, but also to obtain a more detail picture of the finer cell and tissue structure. The precise measurements which can be *made with a good polarising microscope are* particularly advantageous in the examination of plant cell-walls and plant protoplasm, where very fine structures are revealed which lie far beyond the resolving power of the normal light microscope and therefore cannot be studied by direct observation.

Although certain fine structural details can be observed and identified with a good biological microscope, such as the Wild M11 or M20, using strain-free optics and polarising filters, only precise measurement of the type and degree of birefringence can be used as a basis for determining the cause and structure of double-refracting elements. To study the finest structural details a good polarising microscope is therefore essential. In fact the polarising microscope effectively bridges the gap between normal and electron microscopy

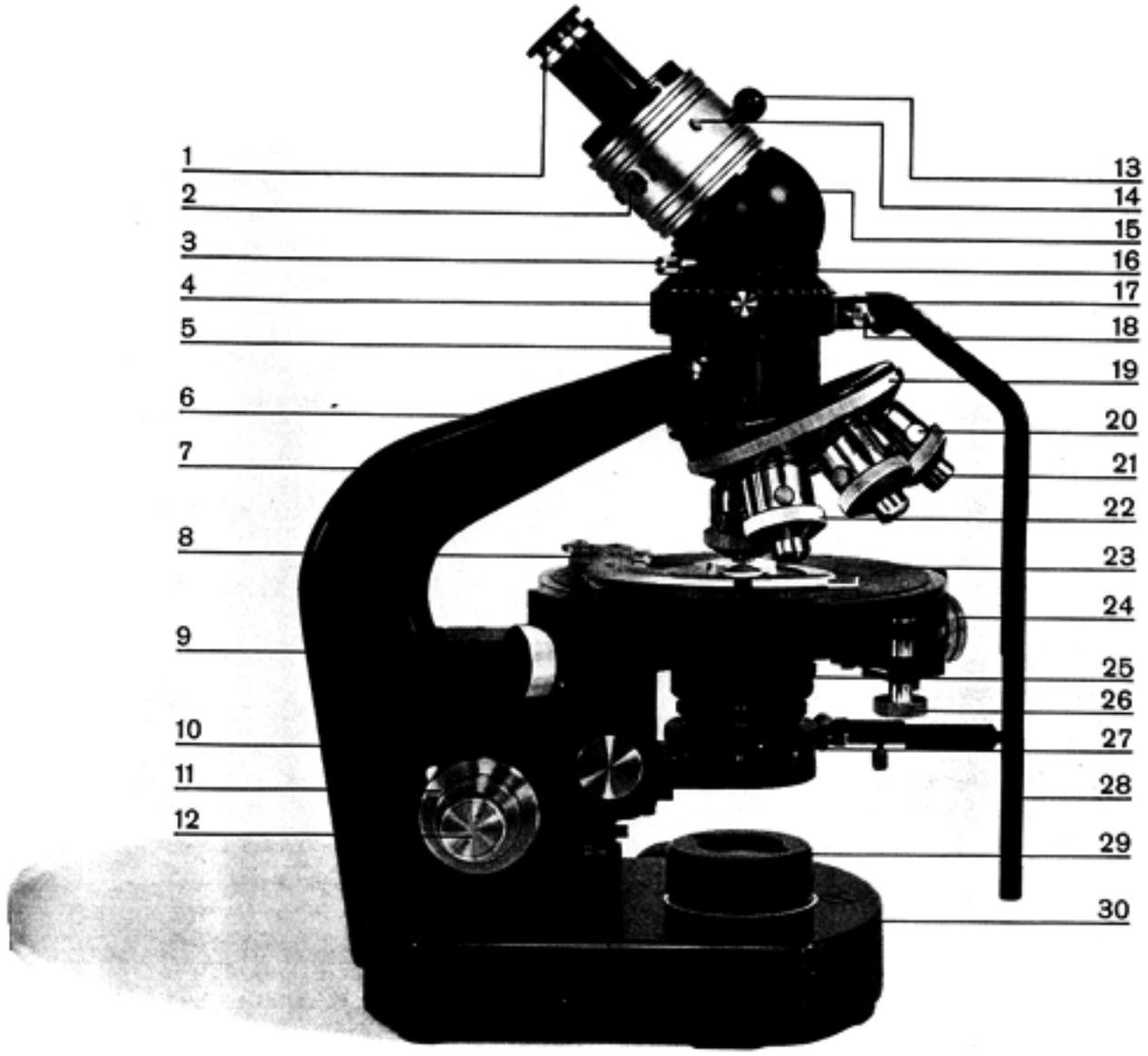


Wild M 21 Polarising Microscope with optical equipment II

nd is a valuable complementary instrument
the electron microscope.
)ccurrence of optical artifacts is far less
ommon in specimens carefully prepared for
olarisation microscopy than in preparations
r electron microscopy.
medicine, the polarising microscope is
sed with particularly good results in such
elds as histology, neurology, and odonto-
gy; its applications as well as its limitations
ave been most carefully studied in the
boratory.
'any branches of technology employ the
olarising microscope. It is used above all in
e textile industry, but also to study wood,
aper, ceramic products, building materials,
od and confectionery products. Modern
iminology depends to a large extent on the
larising microscope.
e construction of the Wild M21 polarising
icroscope follows the well-established prin-
ples of design used in the M20 research mi-
oscope. The base contains a powerful built-
illuminator (6 V / 20 W). Initial alignment
d field diaphragm apertures are controlled
m the side of the base. Fine centering
justments are facilitated by a special
ding insert. This lamp (type S) greatly faci-
ates Köhler illumination. Because of the

d M21 Polarising Microscope with optical
ipment II and synchronised rotation bracket

1	Eyepiece with crosshair recticle
2	Setscrew for vertical adjustment of Bertrand lens
3	Tube setscrew
4	Knurled ring for analyser rotation
5	Slot for compensators
6	Setscrew for nosepiece
7	Microscope stand
8	Mechanical stage
9	Setscrew for rapid stage rotation
10	Condenser drive knob
11	Coarse focusing knob
12	Fine focusing knob
13	Lever for moving Bertrand lens and iris diaphragm in and out of optical path
14	Centering screw for Bertrand lens
15	Monocular inclined tube, model Fp
16	Setscrew for analyser rotation
17	Degree scale for analyser
18	Attachment screw for synchronizing bracket
19	Sextuple nosepiece
20	Objective centering screw
21	Objective (spring loaded)
22	Knurled ring with objective mount
23	Revolving stage with 360° scale and vernier
24	Position knob for 45° stops
25	Condenser
26	Fine-motion control of stage
27	Slot for auxiliary test specimens
28	Synchronising bracket
29	Centering insert of S-lamp
30	Base plate



ateral and offset arrangement of the built-in illuminator, the very bright bulb, even when burning for long periods, does not heat up the base appreciably and does not interfere with the smooth operation of the various drive mechanisms. The built-in illuminator is powered via a regulating transformer.

For combination with separate microscope lamps (e.g. the 6 V / 30 W low-voltage lamp or the Wild universal lamp), the stand can easily be equipped with a mirror carrier and mirror in place of the built-in illuminator.

The condenser drive mechanism, which can be adjusted for smoothness, is conveniently operated by knobs located on both sides of the substage.

The polariser is located below the condenser and can be swung out to the side and changed in this position. It can be rotated through 360° and has click-stops every 90°. It is graduated every 15° and the 45° positions are numbered. The scale is read from the left side. The direction of oscillation at zero setting is right to left (east to west). A slot is provided in the polariser frame for compensators and wedges. A recommended condenser is the aplanatic 0.65/1.30 swing-out condenser with iris diaphragm and swing-out filter holder.

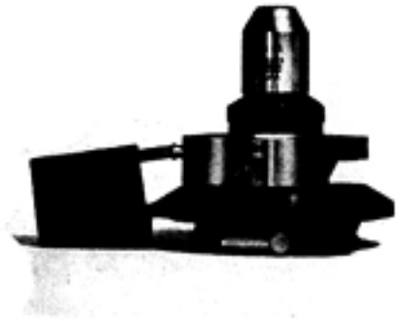
The coarse and fine focusing adjustments are coaxial and low enough to be operated with the hand resting comfortably on the table. The coarse adjustment affects the stand, and its ease of run can be altered at will. The fine adjustment actuates the stage, and is thus not loaded by attachments such as the photomicrographic camera. The large, easily-read drum scale of the fine adjustment is divided into intervals of 0.001 mm (1 µ). Since the fine adjustment has practically no play, however, sufficiently reliable readings can be made to 0.0005 mm (½ µ).

The following polarisation stages are available:

a) Ball-bearing mounted Qp Rotating Polarisation Stage with 360° scale division, numbered every 10°, with vernier reading to 0.1°. Stage clamping screw for fixing in any position. Fine adjustment of the stage can be disengaged. Stage stop positions every 45° can be disengaged as desired.

b) Ball-bearing mounted Rp Rotating Polarisation Stage, simplified model. Same as described above but without click-stops and fine adjustment.

A special Cp mechanical stage for mineralogical specimens is available. Range of movement 25×30 mm, with stop positions every 0.2 mm (0.3 mm or 0.5 mm if required) that can be disengaged or changed. It is equipped with scale divisions and vernier to provide readings to 0.1 mm.



Both stages (a) and (b) are designed to accept commercially available universal stages.

There are three possible nosepieces:

a) Interchangeable quadruple, ball-bearing mounted, revolving nosepiece X.

b) Interchangeable sextuple, ball-bearing mounted, revolving nosepiece Y.

c) Quick-change mount Z with single objective centering ring for standard objectives.

The analyser is located above the nosepiece in an intermediate tube with a parallel light path. The analyser can be rotated 180°; it can also be swung out of position and removed completely in the 100° position. A setscrew allows it to be locked in any position. The knurled ring for rotating the analyser is divided into two 180° scales numbered at every 10°. A vernier reads to 0.1°. In the zero position the direction of vibration in the analyser is from front to back (north-south). Below the analyser there is a slot in the 45° position (with a sliding cover) for compensators (opening 12×4 mm). Because of the intermediate tube with its parallel beam of light, focus and magnification of the image remain unchanged when the analyser or compensators are used.

Both polariser and analyser are provided with polarisation filters of the best quality, which provide a high degree of extinction without producing interference colours. Polarisation filters have a great advantage over the Nicols used previously (and combinations thereof) in that high illumination apertures can be used without producing astigmatism. To achieve joint rotation of polariser and analyser in the crossed position, a synchronising bracket can be provided.

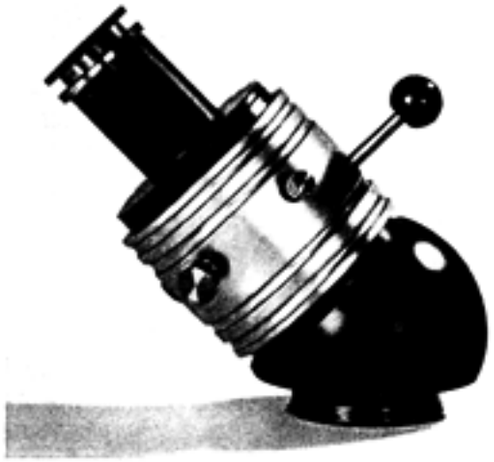
The adapter above the fixed intermediate tube can receive the following tubes with a dovetail-ring mount:

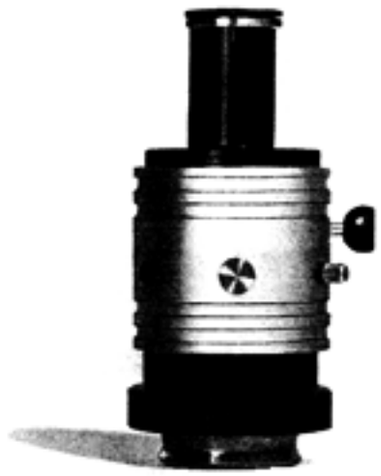
a) Monocular inclined tube Fp with a Bertrand lens (that can be focused and centered) and an iris diaphragm. Both of these can be moved out of the light path as required.

b) Straight Monocular tube Ep with the same characteristics as under (a) but specially designed for photomicrography using the Wild Camera Attachment I with focusing telescope.

Both tubes have orientating slots on the upper edge (90° and plus and minus 45°) for the crosshair eyepieces.

Picture above: Quick-change mount Z with objective centering ring and strain-free achromat 10/0.25





Above: Monocular inclined tube Fp with Bertrand lens and iris diaphragm, adjustable in height and centerable

Middle: Monocular straight tube Ep with Bertrand lens and iris diaphragm, adjustable in height and centerable

Below: Binocular inclined tube Gp

Polarisation objectives. The following five strain-free and coated polarisation objectives are available:

- Pol-Achromat 4/0.10
- Pol-Achromat 10/0.25
- Pol-Achromat 20/0.45
- Pol-Achromat 40/0.65
- Pol-Achromat 100/1.25 oil immersion

All Pol objectives are supplied in centering mounts with easily accessible centering screws which are protected against inadvertent displacement.

The Pol 20, 40 and 100 objectives are spring mounted to protect specimen and front lens.
For additional objectives and eyepieces, consult Wild pamphlets Mi 624 and Mi 680.

Eyepieces:

- Pol-Huygens 6×
- Pol-Huygens 10×
- Pol-Compensating 10×
- Pol-Compensating 15×
- Pol-Compensating 20×

All Pol eyepieces are supplied with crosshairs, orientating pin, and adjustable eye-lens.

Compensators and accessories. The standard outfit contains three compensators in metal frames:

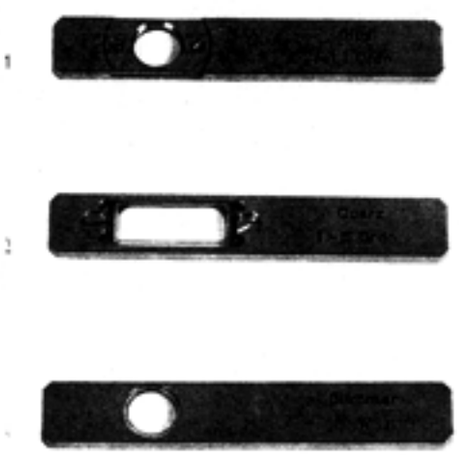
Red I compensator (gypsum) – Sensitive tint.
λ/4 compensator (mica)
Quartz wedge, I–III order

The direction of movement of the faster beam is parallel to the longitudinal direction of the metal frame.

The compensator slot will also accommodate the Berek, Ehringhaus, and Brace-Koehler rotating compensators. Other makes of compensators may be used if the setscrew is removed.

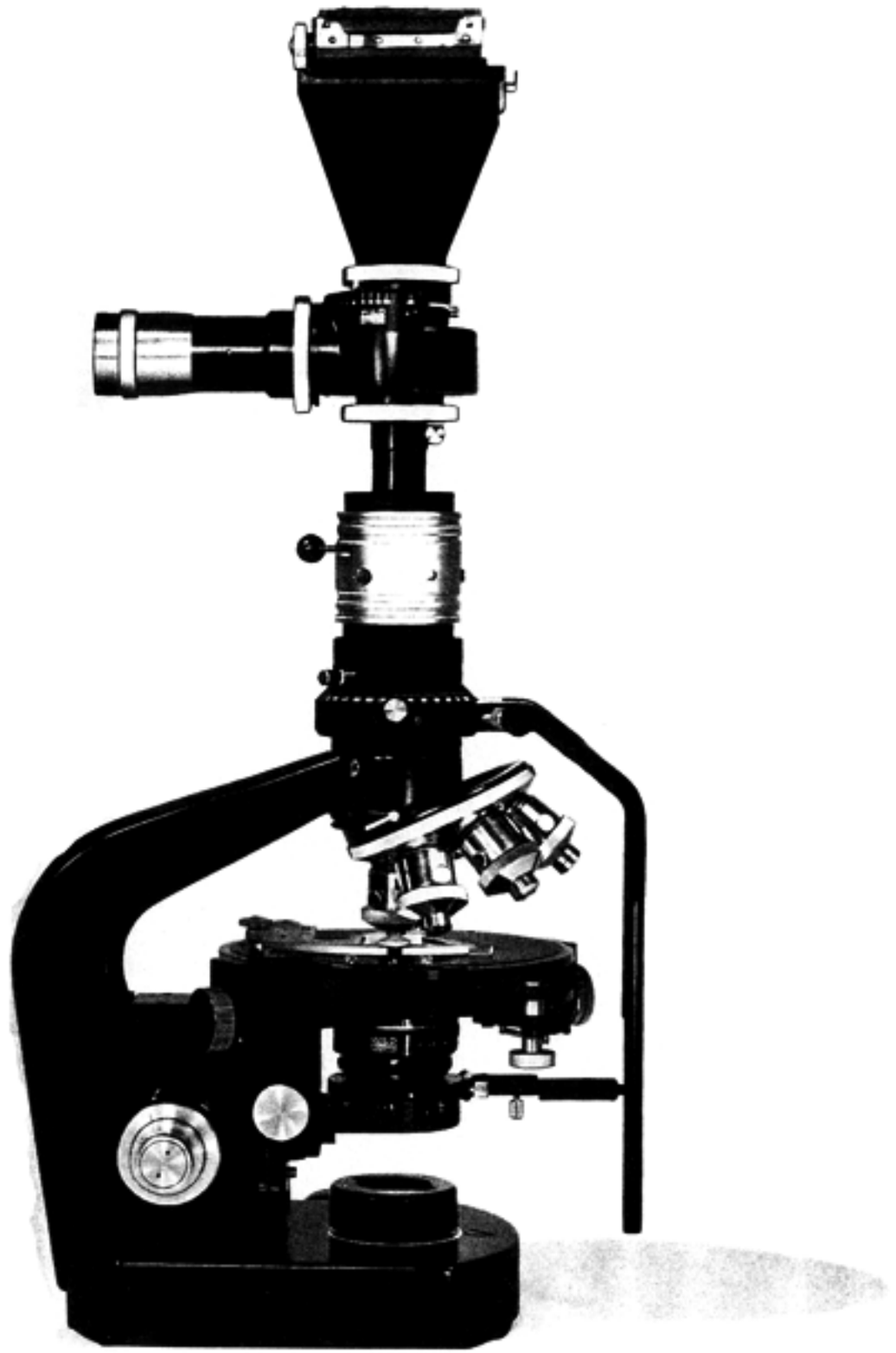
Auxiliary test preparations. An object micrometer with photo-printed scale and a cross reticle made of cellulose tape are used to centre the objectives or to check the position of polariser and analyser.

Packing. While the M21 stand can be kept in the laboratory under a transparent dust cover, a solid mahogany case with lock is available for storage and transportation. Various holders inside this case provide safe storage for the most important accessories. Two drawers are provided for storing separate objectives and eyepieces. For shipment over long distances, the microscope is screwed firmly to the bottom of the case.



1 Red I compensator
2 Quartz wedge I–III order
3 Compensator λ/4

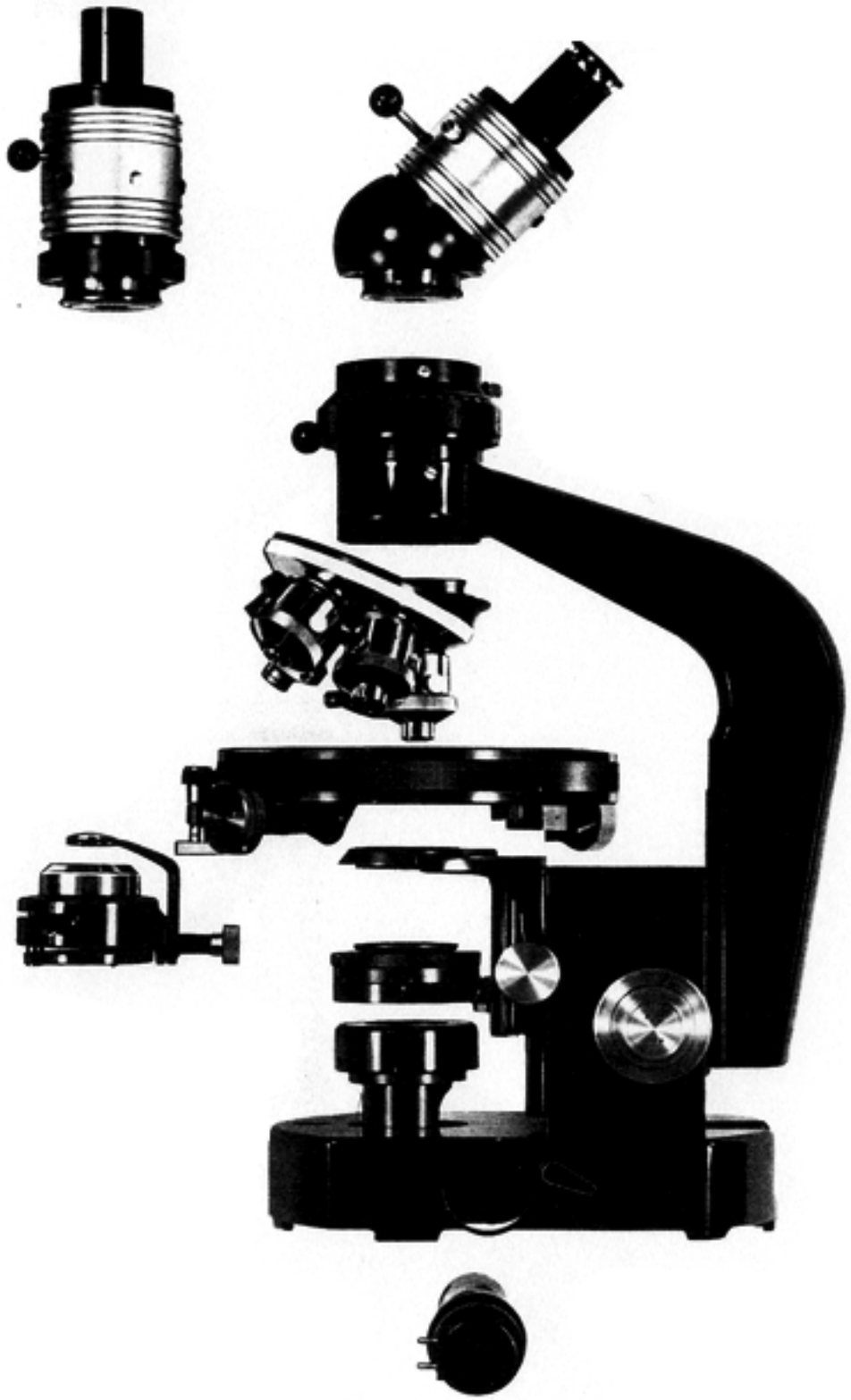
Page 11: Wild M21 Polarising Microscope with camera attachment and adjustable eyepiece



Complete Outfits

	Outfit I	Key No.
Pol M 21	M21 microscope stand with Telan lens system, filter-polariser and analyser, with low placed coaxial coarse and fine focus adjustments, bilateral condenser drive knobs, plano-concave mirror with mirror carrier, but without nosepiece and without case	3000
Z	Quick-change nosepiece, model Z with objective centering ring, including two spanners	3060
Rp	Ball-bearing mounted rotating polarisation stage, model Rp with 360° scale, vernier and clamp	3110
Fp	Monocular inclined tube, model Fp with vertically adjustable and centerable Bertrand lens and iris diaphragm	3100
Cp	Model Cp mechanical stage with controls – Movement in steps of 0.2 mm	3050
S	Built-in illuminator without transformer 6 V / 20 W	7030
	astic dust cover for the microscope	8441
	abinet for the M21, mahogany, with drawers, lock and key	3225
	egulating transformer 0–8 V for built-in illuminator	7400
	ptical equipment for M21/I (see page 15)	3250
	omplete equipment for outfit I	**3280**

	Outfit II	Key No.
Pol M 21	Microscope stand with Telan lens system, filter-polariser and analyser, with low-placed coaxial coarse and fine focus adjustments, bilateral condenser drive knobs, plano-concave mirror with mirror carrier but without nosepiece and without case	3000
Y	Sextuple rotating nosepiece	2641
Qp	Ball-bearing mounted rotating polarisation stage with 360° scale, vernier and clamp together with 45° stops and fine adjustment	3111
Fp	Monocular inclined tube with vertically adjustable and centerable Bertrand lens and iris diaphragm	3100
Cp	Mechanical stage with controls – Movement in steps of 0.2 mm	3050
S	Built-in illuminator without transformer 6 V / 20 W	7030
	Plastic dust cover for the microscope	8441
	Cabinet for the M21, mahogany, with drawers, lock and key	3225
	Regulating transformer 0–8 V for built-in illuminator	7400
	Optical equipment for M21/II (see page 15)	3251
	Complete equipment for outfit II	**3280**



Exploded view of the Wild M21

Components of the Wild M21 Polarising Microscope

	Key No.
Optical equipment for M21/I	
Aplanatic swing-out condenser 0.65–1.30 Pol	3190
Achromat 4/0.10 strain-free	5002/3170*
Achromat 10/0.25 strain-free	5005/3170*
Achromat 20/0.45 strain-free	5010/3170*
Achromat 40/0.65 strain-free	5015/3170*
Achromat 100/1.25 strain-free (oil immersion)	5025/3170*
Objective centering ring	3061
Pol-Huygenian eyepiece 10× with crosshairs	3176
Pol compensating eyepiece 15× with crosshairs	3179
Red I compensator	3200
λ/4 compensator	3201
Quartz wedge, I–III order	3202
Complete optical equipment	**3250**

* Key number 3170 represents the additional price for normal Achromats that are strain-free. They are recognized by the mark "Pol".

Optical equipment for M21/II	
Aplanatic swing-out condenser 0.65–1.30 Pol	3190
Pol-Achromat 4/0.10 in centering mount	3150
Pol-Achromat 10/0.25 in centering mount	3151
Pol-Achromat 20/0.45 in centering mount	3152
Pol-Achromat 40/0.65 in centering mount	3153
Pol-Achromat 100/1.25 in centering mount (oil immersion)	3154
Pol-Huygenian eyepiece 10× with crosshairs	3176
Pol compensating eyepiece 15× with crosshairs	3179
Red I compensator	3200
λ/4 compensator	3201
Quartz wedge, I–III order	3202
Complete optical equipment	**3251**

Other equipment	Key No.
M21 microscope stand with Telan lens system, filter-polariser and analyser, with low placed coaxial coarse and fine focus adjustments, bilateral condenser drive knobs, plano-concave mirror with mirror carrier, but without nosepiece and without case	3000
Built-in illuminator with 6 V / 20 W bulb and connection cable, without transformer	7030
Regulating transformer, 0–8 V / 50 W, for 110/220 V a.c. with double outlet and voltmeter	7400
Ball-bearing mounted rotating polarisation stage, model Rp with 360° scale, vernier and clamp	3110
Ball-bearing mounted rotating polarisation stage, model Qp with 360° scale, vernier and clamp, 45° stops and fine adjustment	3111
Model Cp mechanical stage with control knobs – Movement in 0.2 mm steps	3050
Control knobs (replacement pair) – Movement in 0.3 mm steps	3051
Control knobs (replacement pair) – Movement in 0.5 mm steps	3052
Monocular inclined tube, model Fp with vertically adjustable and centerable Bertrand lens and iris diaphragm	3100
Quadruple nosepiece, model X with ball-bearing mount	2640
Sextuple nosepiece, model Y with ball-bearing mount	2641
Quick change nosepiece, model Z with objective centering ring, and two spanners	3060
Spanners only (spare)	3062
Objective centering ring only	3061
Synchronising bracket	3070
Aplanatic swing-out condenser 0.65–1.30 Pol	3190
Pol-Achromat 4/0.10 in centering mount	3150
Pol-Achromat 10/0.25 in centering mount	3151
Pol-Achromat 20/0.45 in centering mount	3152
Pol-Achromat 40/0.65 in centering mount	3153
Pol-Achromat 100/1.25 in centering mount (oil immersion)	3154
Additional price for strain-free standard Achromats	3170

		Key No.
Pol-Huygenian eyepiece	6× with crosshairs	3175
Pol-Huygenian eyepiece	10× with crosshairs	3176
Pol compensating eyepiece	6× with crosshairs	3177
Pol compensating eyepiece	10× with crosshairs	3178
Pol compensating eyepiece	15× with crosshairs	3179
Pol compensating eyepiece	20× with crosshairs	3180
Red I compensator		3200
λ/4 compensator		3201
Quartz wedge, I–III order		3202
Filter, polariser (spare)		3210
Filter, analyser (spare)		3211
Cabinet for the M21, mahogany, with drawers, lock and key		3225
Test preparation for centering the stage		8411
Test preparation for checking the direction of oscillation		8412
Bulb 6 V / 20 W clear for S-lamp		7357

Additional accessories	
Binocular inclined tube, model Gp	3102
Monocular straight tube, model Ep with vertically adjustable and centering Bertrand lens and iris diaphragm	3101
Photomicrographic camera I with focusing telescope and camera clamping ring	7501
Photo eyepiece 6×, fixed	5600
Photo eyepiece 10×, fixed	5605
Photo eyepiece 15×, fixed	5610
Measuring eyepiece 6× with reticle scale 10:100	5653
Measuring eyepiece 10× with reticle scale 5:100	5656
Screw-micrometer eyepiece, in box	5675
Auxiliary microscope for axial image viewing using binocular tube Gp	6077
Rubber rings for coarse adjustment knobs, pair	2626
Plastic dust cover for the microscope	8441

Please ask for special literature on phase contrast, projection and drawing instruments, as well as high-performance lamps, etc.

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