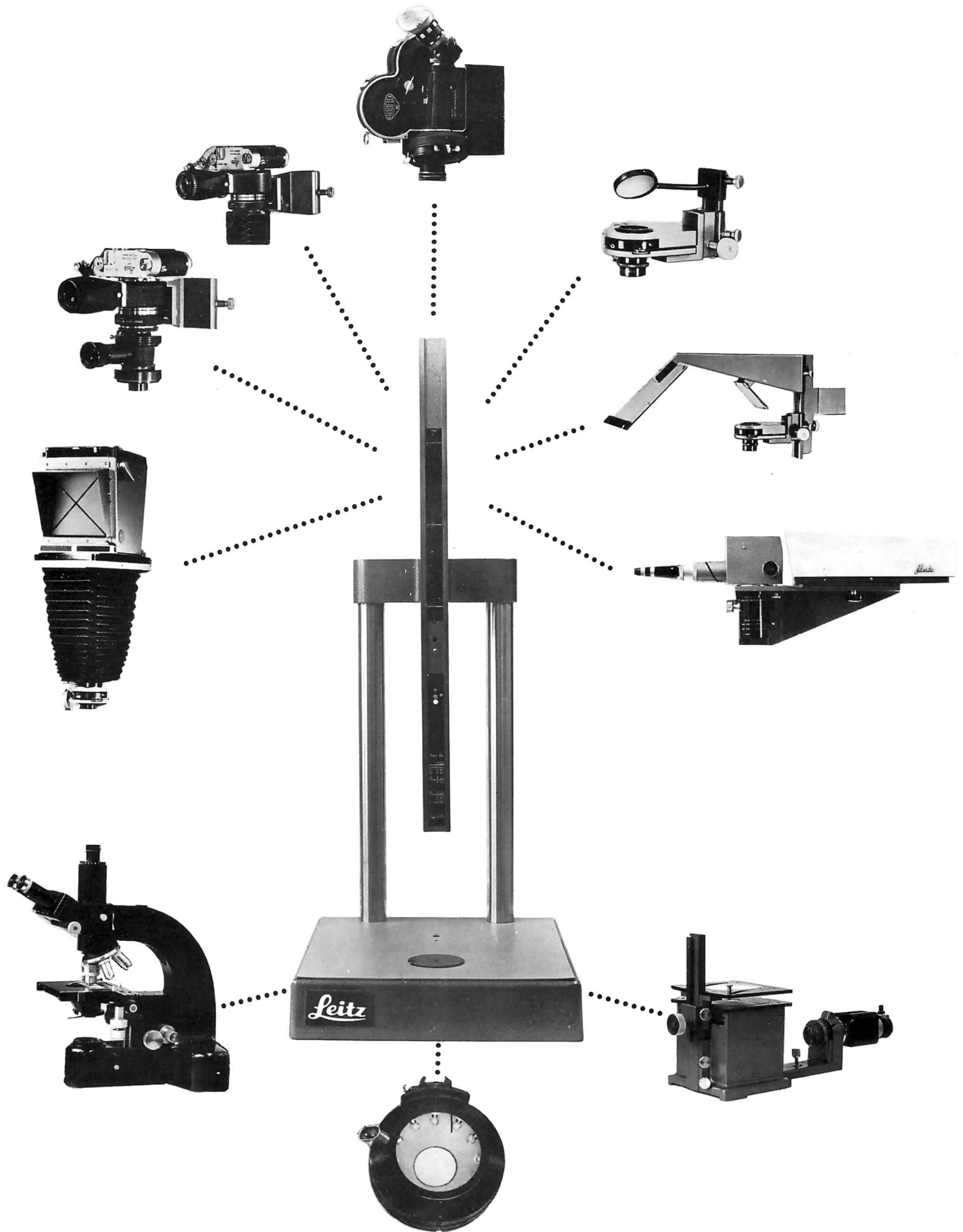


ARISTOPHOT

Instructions

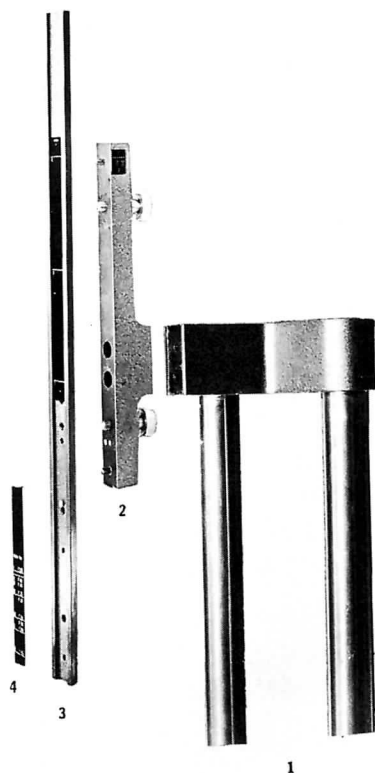


INTRODUCTION

The Leitz ARISTOPHOT is a versatile photographic apparatus for photomicrographic and photomacrographic work in transmitted and incident light. Microcinematography of growth processes, cell movements, etc. can also be carried out with the ARISTOPHOT. In addition, the instrument can be equipped with a television camera, a macro drawing and macro projection attachment. Any type of microscope may be used. Due to its universal applications and due to the interchangeability of various attachments, the ARISTOPHOT offers many advantages.

This instruction book is not intended to explain basic microscope and photomicrographic techniques but to introduce the user to the assembly, operation and care of his ARISTOPHOT. For additional information, we refer to the publication "The Microscope and its Application".

General Directions for Setting up the ARISTOPHOT Stand



The ARISTOPHOT stand consists of:

1. Twin column, base stand
2. Camera bracket
3. Prismatic camera bar, 63 cm long, with three settings "I, II, III"
4. Metal scale (only required for Macro-Dia Apparatus)

Fig. 1

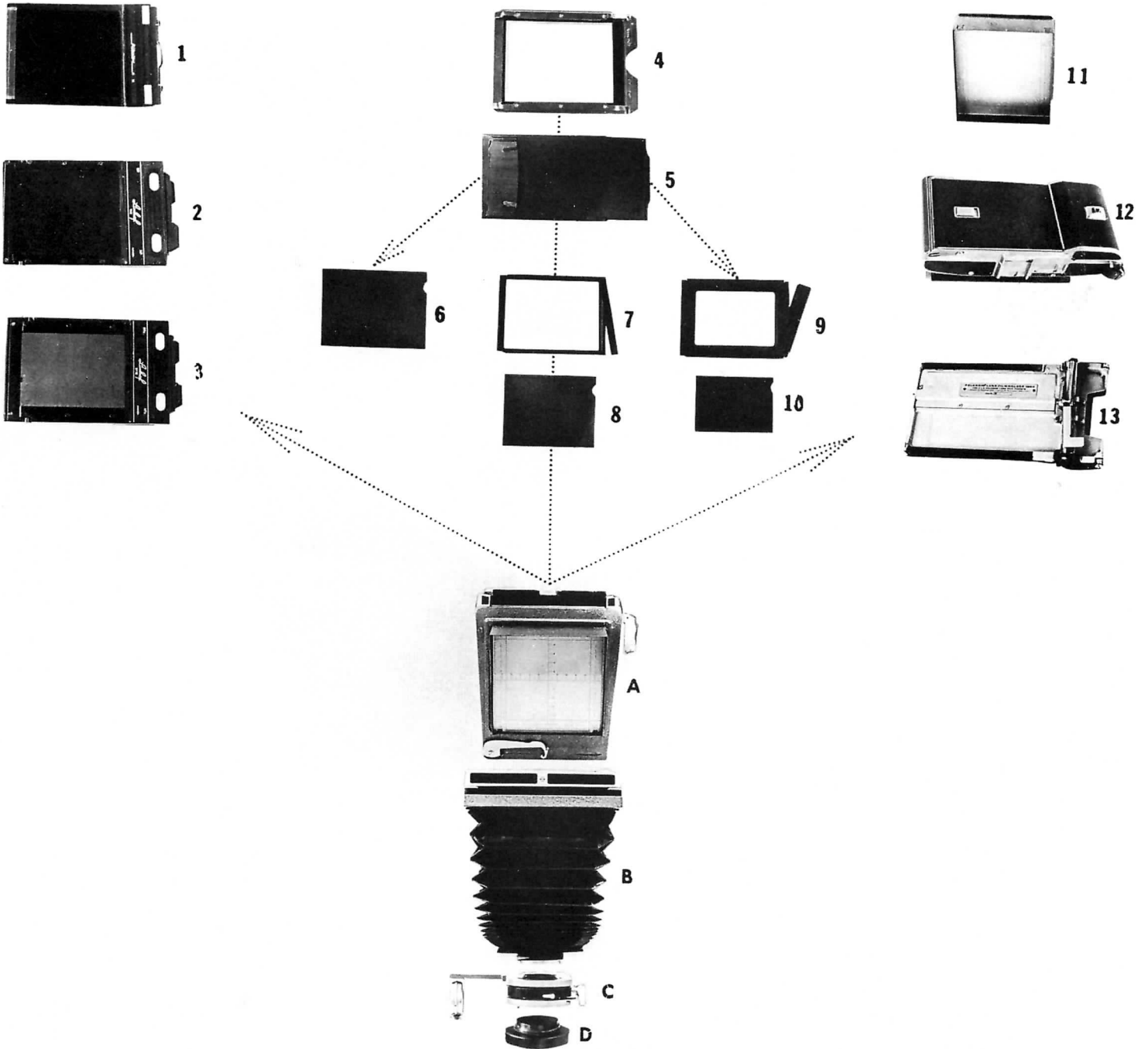
The camera bracket (2) is mounted on the twin column of the basic stand (1) by means of two Allen screws. The plate on the camera bracket (2) marked with I, II, III, has to appear on the right side of the instrument.

The prismatic bar (3) is attached to the camera bracket (2) by means of two knurled fixing screws. Since the adjustment in height of the prismatic bar (3) is important for photomacrography, the bar has a metal scale with markings I, II and III which indicate the three possible positions for attaching the bar to the camera bracket. The desired position (either I, II or III) has to appear opposite the marking "I, II, III" on the camera bracket (2). For photomicrography the prismatic bar has to be attached in position I. For photomacrography it should be positioned according to the markings on the metal scale (4) which indicate the proper position for each macro objective.

Finally the metal scale (4) has to be attached to the prismatic bar (3).

1. PHOTOMICROGRAPHY 4" x 5"

Camera Components



Camera Components

1. Double film holder 4"x 5" (054 330)
 2. Linhof double cassette for plates and cut film 4"x 5" (543 051)
 3. Linhof double cassette for plates and cut film 9 cm x 12 cm (543 050)
 4. Intermediate frame required for use with film sizes of less than 4"x 5" (543 022)
 5. Plate holder 9 cm x 12 cm cut film (543 025)
 6. Insert for 9 cm x 12 cm cut film (543 031)
 7. Insert for 3 1/4" x 4 1/4" plates (543 027)
 8. Insert for 3 1/4" x 4 1/4" cut film (543 029)
 9. Insert for 6.5 cm x 9 cm plates (543 026)
 10. Insert for 6.5 cm x 9 cm cut film (543 028)
 11. Focusing screen for Polaroid land camera back #9108 (542 050)
 12. Polaroid Land camera back #9108 (054 340)
 13. Polaroid Land film holder #500 for 4"x 5" single sheet film (543 052)
-
- A. Mirror reflex housing, rotatable, with swing-out mirror for observing and focusing the image on the ground glass screen. The camera back on the mirror reflex housing is included in the code number of the camera bellows (B in Fig. 2) and can be used directly on the bellows.
 - B. Camera bellows 4"x 5"
 - C. Lower bellows support with shutter and flash contact
 - D. Upper light excluding collar

Assembling the Equipment



Fig. 3

1. Fit the prismatic camera bar at setting No. 1 to the ARISTOPHOT stand by means of both knurled fixing screws.
2. Attach the lower bellows support (C in Fig. 2) to the prismatic bar.
3. Screw the light excluding collar (D in Fig. 2) into the lower bellows support which carries the shutter.
4. Place the microscope on the ARISTOPHOT base.
5. Put the lower light excluding ring over the photo tube and place the eyepiece back into the photo tube.
6. Lower the bellows support until the light excluding collar is in line with the white ring of the lower light excluding collar.
7. Secure the lower bellows support by means of the lateral fixing screws.
8. Attach the camera bellows (B in Fig. 2) to the prismatic camera bar.
9. Secure it with the fixing screw.
10. Set the bayonet locking device of the camera bellows into the negative bayonet of the lower bellows support and lock it.
11. Push the locks (3 in Fig. 4 marked with OFF) of the upper bellows frame (1 in Fig. 4) in the direction of the arrow.

12. Set the mirror reflex housing (A in Fig. 2) onto the upper bellows frame.
13. Push the clamps (2 in Fig. 4) down and slide the mirror housing to engage the clamps.



14. Lock into position by pushing the two locks (2 in Fig. 4) toward the center.
15. Attach the cable release to the shutter.

Fig. 4

Use of the Shutter

The shutter speed dial should be operated in a counter clockwise direction.
(If used clockwise, damage will result)

T = "time setting"; in this position the shutter is opened the first time the cable release is pressed, and closed by pressing the release a second time.

B = in this position the shutter remains open as long as the cable release is pressed and closes when released.

Numbers = the numbers indicate fractions of a second e.g. 10 means 1/10 sec

Sequence of Operating the 4"x 5" Camera for Photomicrography

1. Set the shutter to position "T" and open it.
2. Push the loaded cassette into the cassette holder.
3. Swing the mirror of the reflex housing into the path of light by turning the lateral lever backward.
4. Focus the specimen either on the ground glass, or, for critical focusing with the focusing magnifier, on the diagonal clear glass of the focusing screen.
5. If necessary, figure out the exposure time by means of an exposure meter.
6. Close the shutter.
7. Set the required exposure time on the shutter dial.
8. Swing the lateral lever of the mirror reflex housing forward.
9. Withdraw the darkslide of the cassette, but do not remove the slider completely.
10. Expose the film.
11. Push back the slide before removing the cassette.

General Information

The Alignment of the Microscope:

To obtain good results in photomicrography the alignment of the microscope is most important. Directions for the proper use are published in the Leitz publication "The Microscope and its Application".

Choice of Objectives and Eyepieces:

Achromatic objectives and Plano objectives should only be used with periplanatic eyepieces. These oculars compensate for a certain amount of chromatic magnification difference in the objective.

Achromatic objectives with a numerical aperture higher than 0.50 should also be used with periplanatic eyepieces. However, achromatic objectives with a numerical aperture lower than 0.50 have to be used with Huygens eyepieces.

The following chart indicates with what type of eyepiece each objective should be used.

Description of objective		Focal length	Free working distance	Coverglass correction ¹⁾	Type of Eyepiece
Magnif./N.A.		mm	mm		
Achromatic dry systems	2.5/0.07	56.8	13.6	D O	P
	3.2/0.12	39.8	35	D O	H
	3.5/0.10	31.6	23	D O	H
	6/.018	23.1	17.5	D O	H
	10/0.25	16.3	5.7	D O	H
	25/0.20	7.1	0.92	D	P
	40/0.65	4.5	0.67	D	P
	63/0.85	2.9	0.29	D	P
	Iris 63/0.85	2.9	0.29	D !	P
Achromatic Immersion (W = Water Imm.)	O + W 22/0.65	8.1	0.32	D O	P
	W 90/1.20	2.1	0.09	D	P
	OI 100/1.30	1.9	0.13	D ³⁾	P
	Iris OI 100/1.30—1.10	1.9	0.13	D	P
Fluorite dry systems	FI 40/0.85	4.3	0.38	D !	P
	FI 70/0.90	2.6	0.26	D !	P
Fluorite oil immersion	FI OI 54/0.95	3.4	0.22	D O	P
	FI OI 70/1.30	2.5	0.22	D	P
	FI OI 95/1.32	2.0	0.15	D ³⁾	P
	Iris FI OI 95/1.32—1.10	2.0	0.15	D	P
Apochromatic dry systems	Apo 12.5/0.30	13.0	2.50	D O	P
	Apo 25/0.65	7.3	0.86	D	P
	Apo 40/0.95	4.5	0.12	D ! ²⁾	P
	Apo 63/0.95	3.0	0.12	D ! ²⁾	P
Apochromatic oil immersion	Apo OI 90/1.32	2.0	0.12	D	P
	Apo OI 90/1.40	2.0	0.06	D	P
Plano objectives	PI 4/0.10	41.5	15	D O	P
	PI 10/0.25	17.9	7.5	D O	P
	PI 25/0.50	7.6	0.90	D	P
	PI 40/0.65	4.6	0.58	D	P
	PI Apo OI 100/1.32	2.4	0.27	D ³⁾	P

¹⁾ D: with coverglass, thickness 0.17 mm (adhere to coverglass thickness within ± 0.05 mm)

O: without coverglass

D!: Adhere to 0.17 mm coverglass thickness within ± 0.01 mm; where the objective has a correction mount set it at the real coverglass thickness within this tolerance.

²⁾ These objectives are fitted in a variable correction mount. During adjustment image sharpness is almost completely maintained. Ideal possibility of optimum focusing where the thickness of the coverglass is unknown.

³⁾ These oil immersion objectives can be used also for uncovered specimens (smear preparations without coverglass); the negligible reduction in image quality is not disturbing.

⁴⁾ H = Huygens eyepiece, P = periplanatic or periplanatic wide field eyepieces should be used.

All objectives of 3.5/0.10 and above are adjusted on the revolving nosepiece

Magnification

To determine the total magnification one multiplies the magnification of the objective times the magnification of the eyepiece times the magnification of the intermediate system (tube lens). In addition, the bellows extension must be considered. It has to be measured by means of the tape measure which must be extended to the film plane. Then the total magnification can be calculated in the following way:

$$M = M_{\text{objective}} \times M_{\text{eyepiece}} \times M_{\text{tube factor}} \times \frac{\text{bellows extension}}{25}$$

Example: magnification of objective = 10x
magnification of eyepiece = 8x
magnification of tube lens = 1.25x
bellows extension of camera = 35 cm
conventional distance of vision on which all values are based = 25 cm

$$M = 10 \times 8 \times 1.25 \times \frac{35}{25} = 140 \times$$

Another procedure to determine the magnification is the use of the stage micrometer.

Example: 1 interval of the stage micrometer (1/100 mm)
equals 10 mm on the ground glass screen.

10 divided by 1/100 = 1000

The magnification therefore is: 1000 x.

The resolving power of the microscope objective determines the total magnification one should choose for photomicrography. It depends on the numerical aperture (N.A.) of the objective. The higher the numerical aperture, the higher the resolving power. The total magnification should be between 500 x and 1000 x of the numerical aperture of the objective. This range is called "useful magnification".

2. PHOTOMICROGRAPHY 35 mm

Camera Components



- 1 LEICA camera with bayonet mount
- 2A Focusing magnifier 5 x
- 2B Micro mirror reflex housing with swing-out mirror and interchangeable clear and ground glass focusing screens
- 2C Intermediate adapter
- 2D Mounting bracket for the prismatic camera bar of the ARISTOPHOT
- 3 Intermediate 1/3 x reducing lens
- 4A Focusing telescope with shutter
- 4B Intermediate ring which connects the focusing telescope with the upper light excluding collar
- *4C Upper light excluding collar
- *4D Lower light excluding collar which is placed onto the photo tube of the microscope
- 5 Cable release for operating the prism and the shutter
- 6 Cable release coupler to operate the prism and the shutter in correct sequence
- 7 Cable release for the camera

Fig. 5

* Make sure that the proper light excluding collars are used for the different eyepieces and the corresponding photo tubes.

Assembling the Equipment

1. Fit the prismatic camera bar at vertical setting "I" to the ARISTOPHOT stand using both knurled fixing screws.
2. Mount the micro mirror reflex housing (2.B in Fig. 5) onto the intermediate adapter (2 C in Fig. 5); red dot to red dot and turn the adapter clockwise.
3. Secure the intermediate adapter (2 C in Fig. 5) which carries the mirror reflex housing (2 B in Fig. 5) on the mounting bracket (2 D in Fig. 5) with the aid of the knurled tripod screw.
4. Attach the intermediate $1/3 \times$ reducing lens to the thread at the front of the intermediate adapter (2 C in Fig. 5).
5. Fit the focusing telescope (4 A in Fig. 5) in the same way without tightening this connection. Align the telescope by setting it parallel to the focusing magnifier of the reflex housing. Secure it in this position by turning the lower milled ring of the $1/3 \times$ lens against the focusing attachment.
6. Fit the threaded intermediate ring (4 B in Fig. 5) to the focusing telescope.
7. Screw the upper light excluding collar (4 C in Fig. 5) into the intermediate ring (4 B).
8. Load the LEICA camera (1 in Fig. 5) with film and fit the LEICA body to the mirror reflex housing (2 B in Fig. 5) as described below.
(See Fig. 7)



Fig. 6

Mounting the LEICA on the Mirror Reflex Housing:

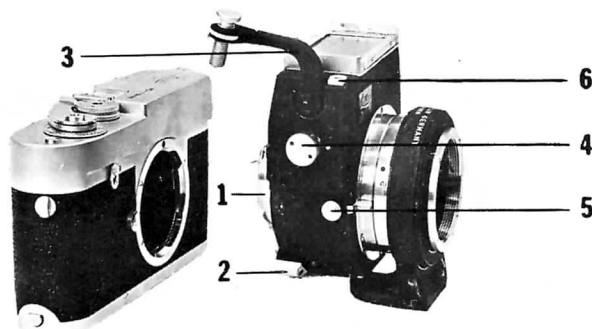


Fig. 7

Bayonet fitting to attach VISOFLEX III to LEICA M1, M2, M3 or MDA (Fig. 7/1)

Bayonet locking lever (Fig. 7/2)

Release lever acting directly on LEICA release button, causing VISOFLEX III mirror to rise before camera shutter is released (Fig. 7/3)

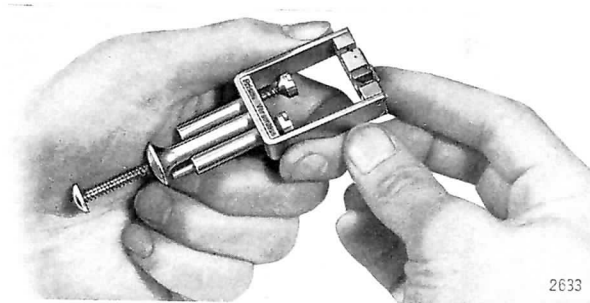
Mirror action selector dial (Fig. 7/4)

Locking catch for intermediate adapter (Fig. 7/5)

Receptacle for cable release (Fig. 7/6)

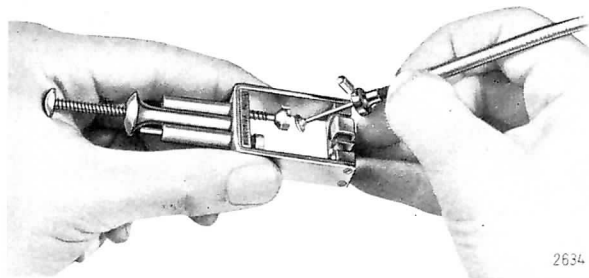
- a) Set bayonet lever (2 in Fig. 7) in lowest position, matching red dots on handle and housing.
 - b) Insert VISOFLEX III directly into LEICA-M camera bayonet mount and turn very slightly in both directions to make sure that the housing is properly seated.
 - c) Use thumb to press bayonet locking lever (2 in Fig. 7) up as far as it will go.
 - d) Set the mirror action selector dial (4 in Fig. 7) on the yellow and black dots for visual observation and focus through the magnifier.
 - e) For photography switch the dial (4 in Fig. 7) on the red dot and use the cable releases for the exposure.
9. Fit the camera assembly to the prismatic camera bar and clamp in position when the upper light excluding collar covers the lower light excluding collar of the microscope to the white line.
 10. Connect release coupler with the two separate wire releases as described in Fig. 8. Attach the release with the engraving "Verschluss" to the shutter release of the focusing telescope. The other release with the engraving "Prisma" is attached to the receptacle through which the swing-out prism can be operated. It is located below the shutter dial. Connect the camera cable release with the micro mirror reflex housing (2 B in Fig. 5).
 11. Attach the focusing magnifier (2 A in Fig. 5) to the mirror reflex housing (2 B in Fig. 5).

Setting up the Cable Release Coupler



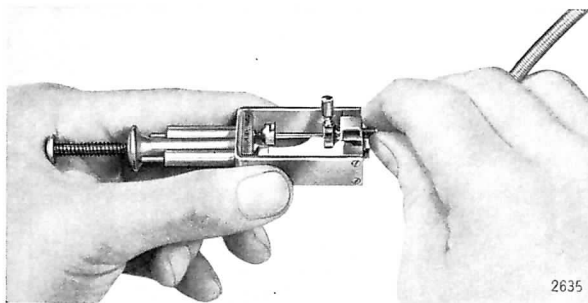
Insertion of wire releases into the release coupler
Push the bolt bar upwards and turn the plungers so that the depressions on their edges appear uppermost (i. e. towards the engraving "Prisma-Verschluss").

Fig. 8 a



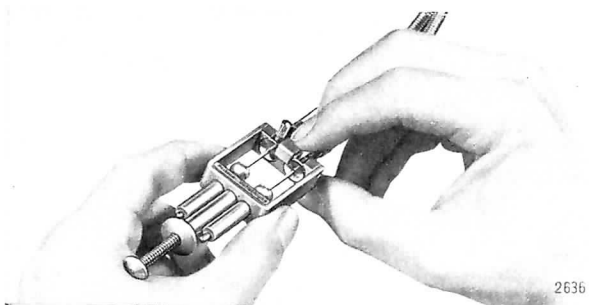
Insert the wire release with the fixing screw by pushing the release button under the depression on the plunger marked "Prisma".

Fig. 8 b



Put the wire release into the guide groove in the coupler frame in such a way that the guide head with fixing screw fits into the recess of the guide groove.

Fig. 8 c



When the second wire release has been similarly inserted and both guide heads are correctly bedded in their frame recesses, the locking bar is again pressed down. Both releases are then firmly retained in the coupler, and pressing down its spring-loaded single control will actuate prism and shutter in the correct sequence.

Fig. 8 d

Sequence of Operation

1. Set mirror selector dial (4 in Fig. 7) of the mirror reflex attachment to the double dots (black and yellow).
2. Set the shutter of the focusing telescope (4 A in Fig. 5) to "T" and press the release to open the shutter. (In case the release coupler is used, press this coupler.)
3. Focus the specimen. For low magnifications (less than 200 x) use the clear glass or ground glass focusing screen of the mirror reflex attachment (2B in Fig. 5). For magnifications higher than 200 x, use the focusing telescope (4 A in Fig. 5). In both cases one has to adjust the eyelenses of the magnifiers so that the built-in graticule appears in focus (see general instructions for 35 mm photomicrography).
4. Determine the exposure time by means of an exposure meter.
5. Close the shutter.
6. Select the exposure time on the shutter dial.
7. Switch the mirror selector dial of the mirror reflex attachment to the red dot.
8. Set the LEICA shutter to "B".
9. Press the cable release of the mirror reflex attachment. This cable release operates the LEICA shutter. As long as the cable release is pressed the shutter remains open.
10. To take the exposure press the double release coupler. This swings out the prism of the focusing telescope and releases the central shutter.
11. After exposure close the LEICA shutter by releasing the cable release of the mirror reflex attachment.
12. Turn the transport lever or knob of the LEICA for the next exposure.

General Instructions

To obtain good photomicrographs the proper adjustment of the microscope is most important. For those who are not familiar with the setting-up of a microscope the booklet "The Microscope and its Application" will be helpful.

Unlike the large camera for 4" x 5" plates, the photomicrographic equipment with the LEICA, the mirror reflex housing and the focusing attachment operates with a fixed camera length. The intermediate lens reduces the microscope image to 1/3 of its magnification so that the 35 mm negative must be enlarged three times (7.5 x 10 cm or 3 1/4" x 4 1/4") to correspond with the magnification seen visually in the microscope. For special purposes an intermediate reducing lens 1/2 x is available.

Graticule of the focusing telescope:

Heavy-line large rectangle shows image area photographed with the 1/3 x intermediate adapter. Broken-line medium rectangle indicates image area covered by the 1/2 x adapter. The small rectangle in the center facilitates the focusing of the graticule by means of the eyepiece correction mount and is identical to the field of a 1 x adapter, now discontinued.

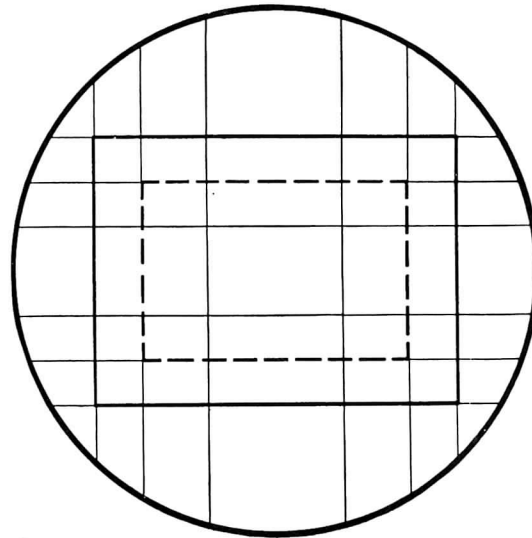


Fig. 9

The focusing of the microscope image with low and medium magnifications should be carried out with the clear glass screen of the mirror reflex attachment. (2 B, Fig. 5). Before doing so the focusing magnifier must be adjusted to the operator's eyesight by focusing on the double circles in the center of the clear glass. The image area on the screen is identical with that appearing on the 35 mm film. The image frame is also visible in the telescope of the focusing attachment (see Fig. 9).

For magnifications over 200 x the focusing telescope (4 A in Fig. 5) is used. Before focusing the image the telescope must be adjusted so that the built-in reticle appears in focus. The focusing-viewing attachment also renders it possible to observe the specimen while the photomicrograph is being taken. In this case the swing-out prism is left in the path of light and only the cable release of the shutter is used. (Do not use double release coupler).

The beam splitting prism transmits 75% of the light to the film plane and 25% to the focusing telescope.

3. TRANSMITTED LIGHT PHOTOMACROGRAPHY

MACRO-DIA APPARATUS

Components:

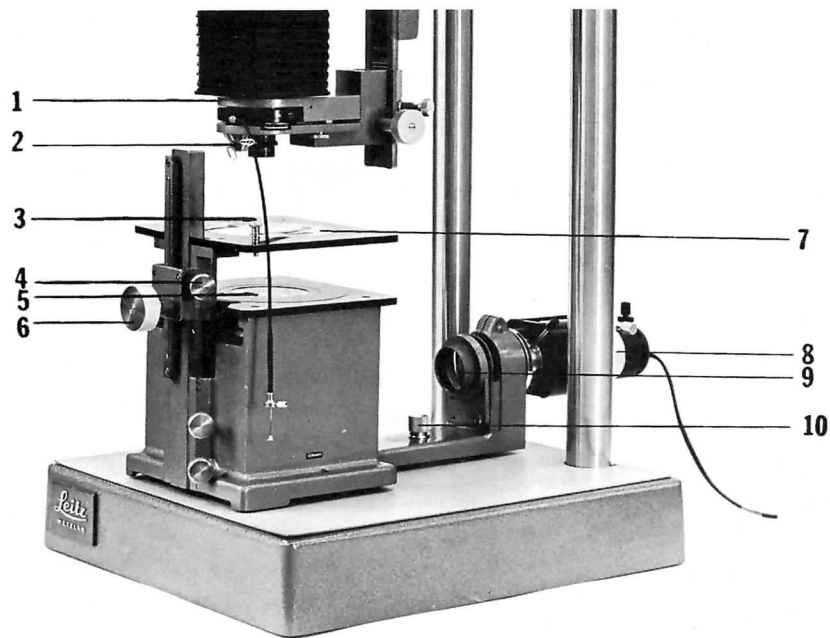


Fig. 10

1. Lower bellows support
2. Photographic lens (SUMMAR or MILAR)
3. Object stage
4. Clamping screw for the vertical stage adjustment
5. Condenser lens
6. Rack and pinion for vertical stage movement
7. Stage insert
8. Lamp
9. Swing-out collector lens
10. Knurled screw for fastening Macro-Dia Apparatus to the ARISTOPHOT base

Assembling the Equipment



Fig. 11

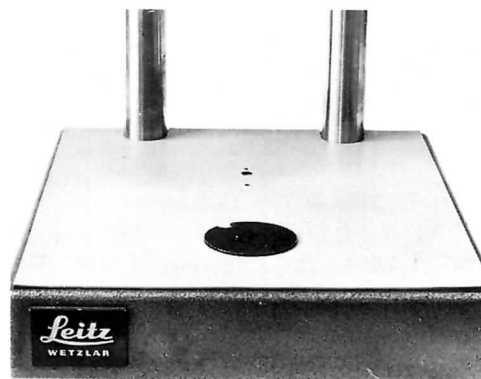
1. Fit the prismatic bar (3 in Fig. 1) in position I, II or III depending on the focal length of the lens to be used. The setting can be read off the metal scale (Fig. 12) which is attached to the prismatic bar.
Example: Using a 120 mm lens attach the prismatic bar at position I to the camera bracket (2 in Fig. 1).
2. Slide the lower bellows support, which carries the shutter onto the prismatic bar, and lock it.
3. Slide the 4"x5" camera attachment onto the prismatic bar. (For detailed information see Photomicrography 4"x5", Assembling the Equipment.)
4. Set the bayonet locking device of the camera bellows into the negative bayonet of the lower bellows support and lock it.

5. Place the macro-dia apparatus on the ARISTOPHOT base. The macro-dia apparatus should engage the black positioning plate (Fig. 13) on the ARISTOPHOT base. Secure it by tightening the milled screw (10 in Fig. 10) which fastens the macro-dia apparatus to the base.



Fig. 12

Fig. 13



6. Insert the lamp (8 in Fig. 10) into the lamp holder and connect the cord to the transformer.
7. Select the photographic lens, the corresponding condenser lens and the stage insert from table, Fig. 14.

8. Screw the lens (2 in Fig. 10) into the corresponding adapter and then into the lower bellows support.
9. Bring the bottom plate of the lower bellows support to the height indicated on the metal scale (Fig. 12) of the prismatic bar for the particular objective used.
10. Insert the corresponding condenser lens (5 in Fig. 10) into the macro-dia apparatus.
11. Place the stage insert (7 in Fig. 10) on the stage.
12. Check the centration of the low voltage filament lamp. Concentrate the illumination on the ground glass screen by moving the collector lens in the lamp housing back and forth.
If the light spot appears outside the center of the field, operate the two centering screws. Remove the swing-out negative lens (9 in Fig. 10) for this procedure.

Table of Image Scales:

Obtainable with the macro-dia equipment with Summar and Milar lenses, interchangeable stage inserts and condenser lenses.

SUMMAR Focal Length	MILAR Focal Length	When taking photographs size 4" x 5". LEICA 24 mm x 36 mm		
		Image Scale	Stage Insert	Condenser
120 mm	100 mm	1:1 - 4:1	80 mm	120
		1:1 - 5:1	70/60/50 mm	100
80 mm	65 mm	1:1 - 7:1	60/50/40 mm	80
		2:1 - 10:1	45 mm	65
42 mm	50 mm	2:1 - 12:1	40 mm	42
		2:1 - 13:1	30 mm	42
35 mm		4:1 - 16:1	25 mm	35
24 mm		5:1 - 25:1	15 mm	24

Sequence of Operation for the Macro-dia Apparatus

1. Set the shutter dial to position "T" and open it.
2. See that the diaphragm in the lens is completely open. This diaphragm should only be used for photomacrography in incident light and remain open in transmitted light photomacrography.
3. Swing the lever of the mirror reflex housing back so that the image appears on the ground glass.
4. Check even illumination on the ground glass screen of the mirror reflex housing by moving the collector lens back and forth. Stop at a position where the illumination is even over the entire field.
5. Make sure that the negative lens (9 in Fig. 10) is used properly. This lens is used only when taking photographs with lenses of 80-120 mm focal length.
6. Place the specimen onto the object stage.
7. Push the loaded cassette into the cassette holder.
8. Focus the specimen. Focusing should only be carried out by means of the rack and pinion control of the object stage (6 in Fig. 10).
9. Close the shutter and set the required exposure time on the shutter dial. (The use of the exposure meter is described in the instruction booklet which comes with the meter).
10. Swing mirror lever to its vertical position to remove the mirror from the light path.
11. Withdraw the darkslide of the cassette, but do not remove the slide completely.
12. Press camera shutter release to expose the film.
13. Push back the slide before removing the cassette.

Assembling the Equipment for 35 mm

1. Fit the prismatic bar (7 in Fig. 10) in position. I, II or III depending on the focal length of the lens to be used. The setting can be read off the metal scale (Fig. 12) which is attached to the prismatic bar.
2. Slide the lower bellows support which carries the shutter (1 in Fig. 10) onto the prismatic bar.

3. Mount the mirror reflex housing (2 B in Fig. 16) onto the intermediate adapter (2 C in Fig. 16), red dot to red dot and turn the adapter clockwise.
4. Secure the intermediate adapter (2 C) on the mounting bracket (2 D in Fig. 16) by means of the knurled tripod screw.
5. Mount the LEICA on the mirror reflex housing (see detailed instruction on page 12, "Assembling the Equipment for 35 mm Photomicrography.")
6. Attach the focusing telescope (2 in Fig. 16) to the mirror reflex housing.



Fig. 16

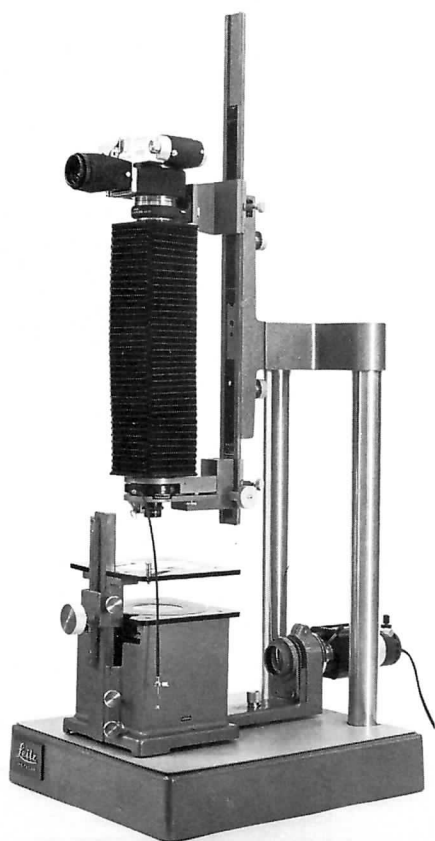


Fig. 15

7. Slide the mirror reflex housing onto the prismatic camera bar and secure it in position according to the required magnification.
8. Screw the camera bellows into the mirror reflex housing, approximately four turns. Do not secure it tightly.
9. Set the bayonet locking device of the camera bellows into the negative bayonet locking device of the lower bellows support and secure it.
10. For further set-up instruction see "Assembling the Equipment for 4"x5", paragraphs 5-12.

Sequence of Operation for 35 mm Photomacrography

1. Set the shutter dial on the lower bellows support to position "T" and open it.
2. Set speed dial of LEICA to "B".
3. Set the mirror selector dial (4 in Fig. 7) of the mirror reflex housing on the yellow and black dots for visual observation and for focusing.
4. Check whether the diaphragm in the lens is completely open. This diaphragm should only be used for incident light photomacrography, and remain open in transmitted light.
5. Check for even illumination on the ground glass of the mirror reflex housing by moving the collector lens back and forth. Stop at a position where the illumination is even over the entire field.
6. Make sure that the negative lens (9 in Fig. 10) is used properly. This lens is used only when taking photographs with lenses of 80-120 mm focal length.
7. Place the specimen on the object stage.
8. Focus the specimen. One can either use the ground glass or the clear glass with the telescope for focusing. Focusing should only be carried out by means of the rack and pinion control of the object stage (6 in Fig. 10).
9. Close the shutter and set the required exposure time on the shutter dial. The use of the exposure meter MICROSIX L is described in the instruction booklet which comes with the meter. The photo cell of the MICROSIX L is held against the ground glass of the mirror reflex housing.
10. Switch the selector dial (4 in Fig. 7) of the mirror reflex housing to the red dot.
11. Press the cable release of the mirror reflex housing. This cable release operates the LEICA shutter. As long as the cable release is pressed, the shutter remains open.
12. Press the cable release of the shutter on the lower bellows support to make the exposure.
13. After exposure close the LEICA shutter by releasing the cable release of the mirror reflex housing.
14. Turn transport lever or knob of the LEICA to transport the film for the next exposure.

General Information

Magnification:

In photography the magnification is related to the image distance (b) and the object distance (g)

$$m = \frac{b}{g}$$

The image distance (b) is the lens-to-film distance and the object distance (g) is the lens-to-specimen distance. Every lens has a certain magnification range which depends on the image distance and the object distance. The table on page 24 lists the magnification range for the different photomacrographic lenses.

NOTE: Theoretically the lens-to-film distance should be measured from the exit principle plane of the lens and the lens-to-specimen distance from the entrance principle plane. For practical reasons, however, the measurements should be made from the lens diaphragm rather than from the principle plane.

To measure the magnification exactly place a scale in the specimen plane. Using another scale on the ground glass the correct magnification can be obtained by dividing the image size (B) by the object size (G).

$$\frac{B}{G} = m$$

NOTE: When the Macro-dia Apparatus is used, the distance between the condenser lens and the objective should never be changed. To set the required magnification, vary the bellows support extension while the lower bellows support remains stationary. The image should only be focused by means of the rack and pinion of the object stage.

Since the mirror reflex housing adds as much as 18 cm to the total camera extension, the housing may have to be removed for lower magnifications. The ground glass screen and the film cassette are then directly on the upper bellows frame.

For low magnification with LEICA equipment the short bellows are used.

Field of View:

The field of view, which means the specimen area which is shown on the photographic frame, is affected by the magnification and the film format. The table below shows the field size for different magnifications.

Magnification	4"x5" Approx. Field Size in mm	24 mm x 36 mm Approx. Field Size in mm	Lens Focal Length in mm
1:4		96 x 144	120
1:3	255 x 335	72 x 108	120
1:2	170 x 225	48 x 72	120
1:1	90 x 115	24 x 36	120 - 100
2:1	45 x 58	12 x 18	120 - 65
3:1	32 x 4	8 x 12	120 - 50
4:1	23 x 28	6 x 9	120 - 42
5:1	18 x 22	4.8 x 7.2	100 - 42
7.5:1	13 x 15	3.2 x 4.8	80 - 30
10:1	9 x 11	2.4 x 3.6	65 - 24
15:1	5.4 x 7.5	1.6 x 2.4	42 - 24
20:1	4.3 x 5.5	1.2 x 1.8	24
25:1	3.2 x 4.5	0.96 x 1.44	24

The lowest magnifications obtainable in incident light photomacrography using the Macro-dia Apparatus are: 1:1 for the 24mm x 36mm frame and 1:1.5 for the 4"x5" frame.

Depth of Field:

Two factors affect the depth of field:

1. The setting of the lens diaphragm
2. The magnification

The table on page 32 lists the depth of field for different magnifications and different F/stops.

The diaphragm numbers marked on the lenses (SUMMAR and MILAR) are so-called Stolze numbers. They are based on a geometric progression. An increase in the Stolze numbers, for example, by a factor of 2 corresponds to an increase in exposure time by a factor of 2. The table below translates these numbers into F/stops (relative opening) and numerical aperture.

Diaphragm Numbers (Stolze)	Relative Opening	Aperture	Diaphragm Numbers (Stolze)	Relative Opening	Aperture
1	1:3.16	0.16	12	1:11	0.05
2	1:4.5	0.11	24	1:15.4	0.03
2.3	1:4.8	0.10	48	1:22	0.02
3	1:5.5	0.09	96	1:31	0.02
4	1:6.3	0.08	192	1:44	0.01
6	1:7.7	0.06			

NOTE: The lens diaphragm should be used in incident light only. In transmitted light with the Macro-dia Apparatus it should remain completely open because otherwise the aperture of the lens will be too small and the image quality would decrease.

4. INCIDENT LIGHT PHOTOMACROGRAPHY

Components

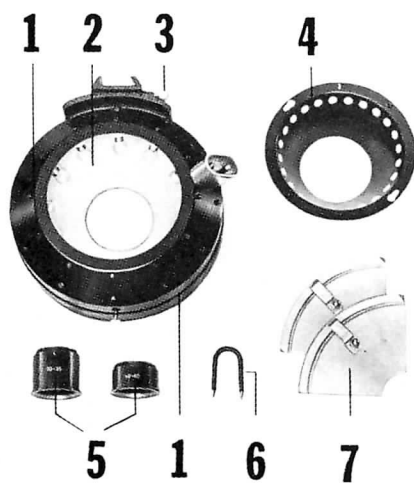


Fig. 17

1. Ring illuminator housing
2. Ring-shaped opal glass disc
3. Bracket with lateral clamping screw to fit the illuminator to the auxiliary prismatic bar
4. Reflector
5. Intermediate collars for using objectives of short focal length in conjunction with the ring illuminator
6. Bulb testing tool
7. Sector diaphragms for varying the cone of light

Assembling the Equipment

1. Fit the ring illuminator to auxiliary prismatic bar and secure by means of lateral clamping screw.
2. Mount ring illuminator with auxiliary bar onto the ARISTOPHOT base using the milled screw (Fig. 18).
3. Attach photographic equipment, either bellows camera for 4"x5" or the LEICA 35 mm camera attachment, as described above in photomacrography for transmitted light. The positions of the lower bellows support and the camera depend on the required magnification. The lower bellows with the shutter can be fitted either onto the prismatic camera bar or onto the auxiliary bar (see Fig. 18).
4. Screw the required lens into the corresponding adapter ring and then into the lower bellows support. For lenses under 50 mm focal length an extension collar (5 in Fig. 17) must be used to bring the lens close enough to the specimen. The range of focal lengths for which they are suitable is engraved on the collars. (They are not needed when photomacrographs are taken without the ring illuminator.)
5. Connect the ring illuminator to the regulating resistance (rheostat).



Fig. 18

of the testing tool (6 in Fig. 17). When the bulbs light up, it indicates that the bulb in the socket bridged by the testing tool is the defective one.

The depth of field is controlled by the iris diaphragm of the photographic lens.

Otherwise, the same directions apply as given for photomacrography in transmitted light.

Sequence of Operation

For taking photomacrographs in incident light the same directions apply as given for transmitted light photomacrography, with the following exceptions:

1. Focusing of the image on the screen may be done with the rack and pinion of the lower bellows support.
2. The lens diaphragm may be used to obtain a larger depth of field.

General Information

To find the most favorable illumination of the specimen the ring illuminator can be raised or lowered. Special lighting effects are obtainable by means of adjustable sector diaphragms (7 in Fig. 17) which are inserted into the ring illuminator. The low-voltage filament bulbs (8 Volts, 0.6 Ampères) of the ring illuminator are connected in a series of six. If one of the bulbs becomes defective, the defect can be found by shorting the connections of the individual bulbs with the aid

5. MICRO CINEMATOGRAPHY

Apart from the basic stand and the microscope the following items are required for cinematography:

Camera Holder

Special Objective

Focusing Attachment

Arriflex Corporation of America will supply a camera holder for their 16 mm camera. A special objective, 82 mm focal length, is available from Leitz. This objective fits into the Arriflex "KIZAR" adapter. Both adapter and lens, can be fitted to the 16 mm Arriflex camera. A light excluding collar has to be screwed onto the 82 mm lens. The periscopic finder of the Arriflex camera serves as focusing attachment.

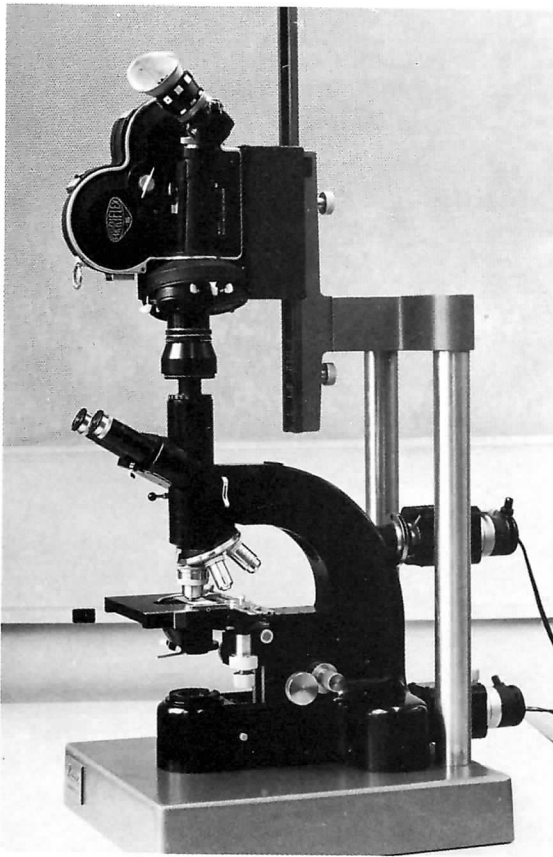


Fig. 19

For the Bolex camera 16 mm, the following items are available:

Camera holders (when ordering, the camera model must be specified.)

A special objective, 52 mm focal length. This lens fits directly into any Bolex 16 mm camera.

Focusing attachment with horizontal telescope and 95% transmission observation prism. While operating the camera, a cable release swings out the prism. This focusing attachment is recommended even for use with the Bolex reflex camera.

Since the 16 mm picture frame will be enlarged on the screen, low magnification eyepieces such as the Huygens 6.3 x or the periplanatic 6.3 x and 8 x are preferable.

In case the movie camera is used at a higher motor speed the use of a shock absorbing support is recommended. A special Vario-attachment with or without light intensity regulator for microcinematography is soon to be available. Details on request.

6. MACRO DRAWING AND PROJECTION EQUIPMENT

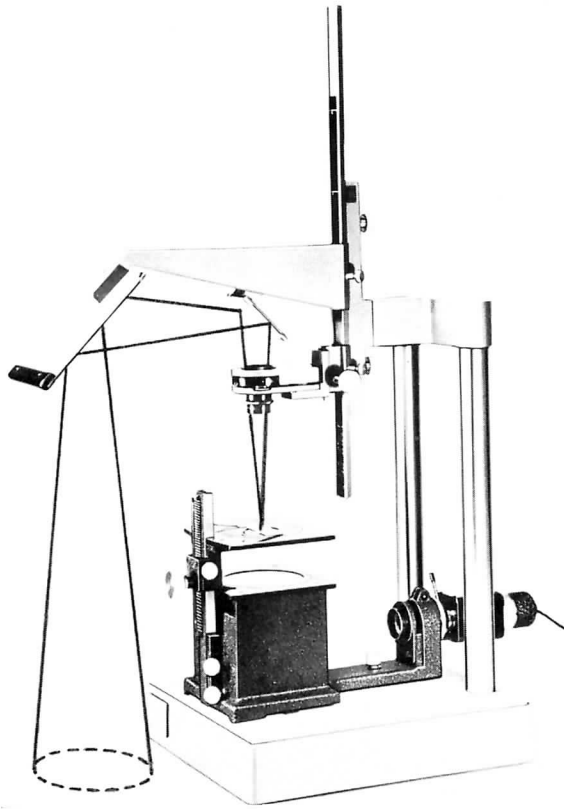


Fig. 20

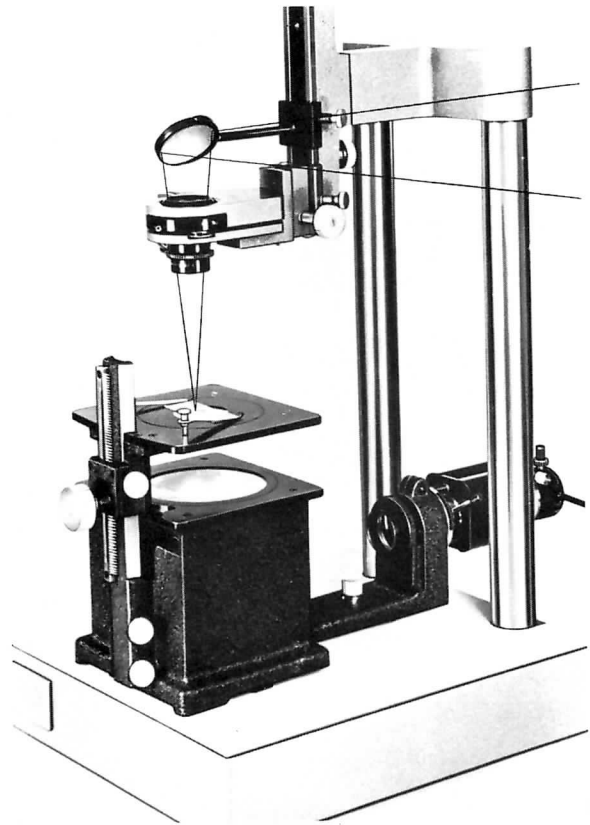


Fig. 21

The outfit is assembled and adjusted as described in transmitted light photomacrography.

The central shutter of the lower bellows support should remain open and its dial is set to "T".

Instead of the camera attachment with the bellows either the large drawing mirror or the small projection mirror is clamped onto the prismatic camera bar.

The magnification can be changed through vertical adjustment of the mirror along the prismatic bar. After the desired image scale has been set, the specimen must be focused by operating the rack and pinion of the object stage of the Macro-dia Apparatus.

Even illumination is obtained by moving the collector lens of the lamp back and forth.

When the projection mirror is used, the room should be adequately dark.

7. HIGH INTENSITY LIGHT SOURCE

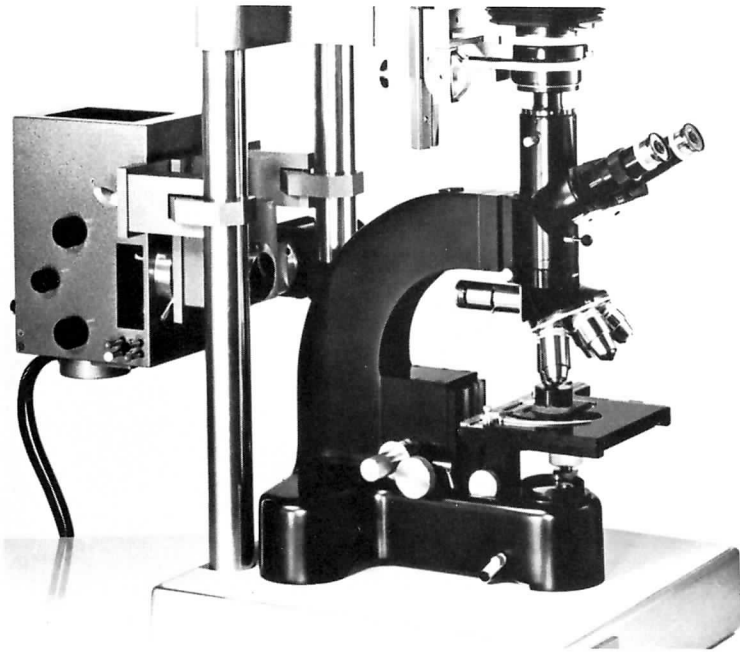


Fig. 22

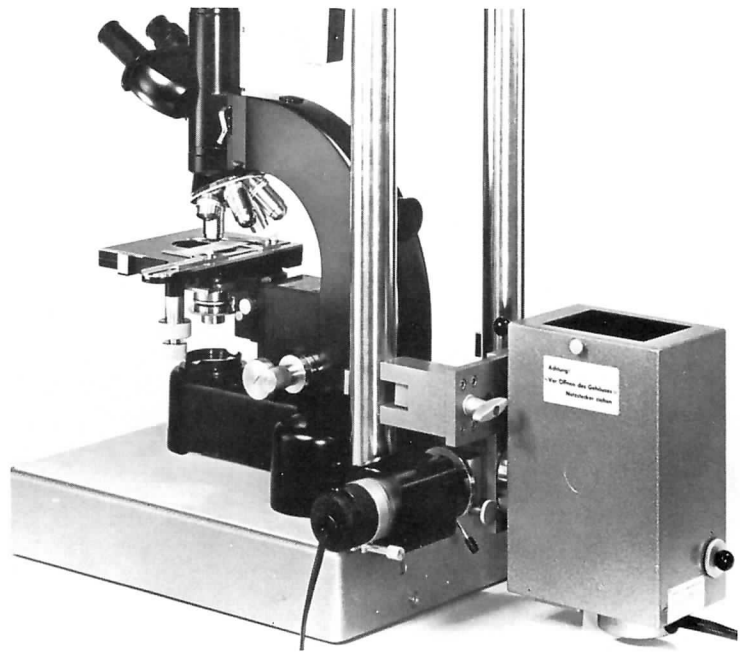


Fig. 23

The built-in attachable low-voltage lamps of Leitz microscopes are well-suited for photomicrography in transmitted light and usually also for incident light and phase contrast.

The ARISTOPHOT, however, permits the use of Xenon and high-pressure mercury lamps for special purposes, e. g. fluorescence, cinematography or darkfield.

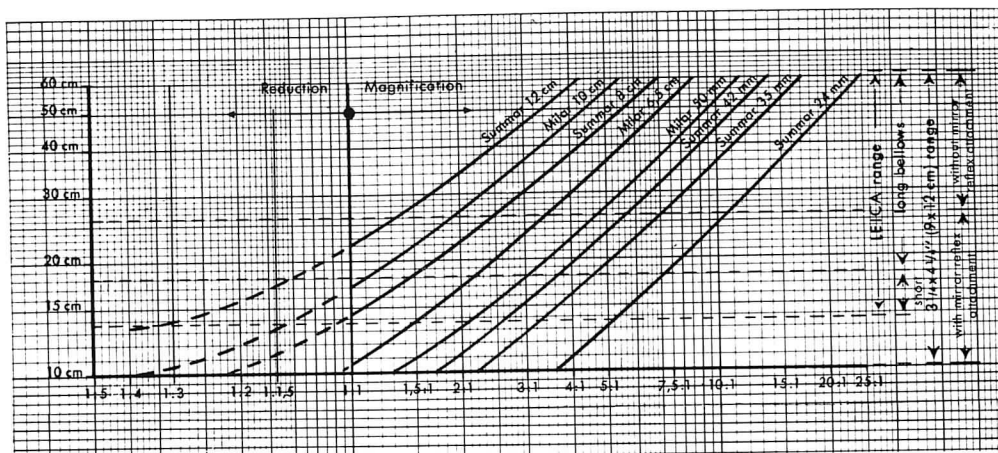
A clamping bracket fits the twin columns of the ARISTOPHOT stand and carries the Universal Lamp Housing 250.

A light tight extension tube is supplied for the proper alignment of this lamp housing to the ORTHOLUX microscope for transmitted or reflected light.

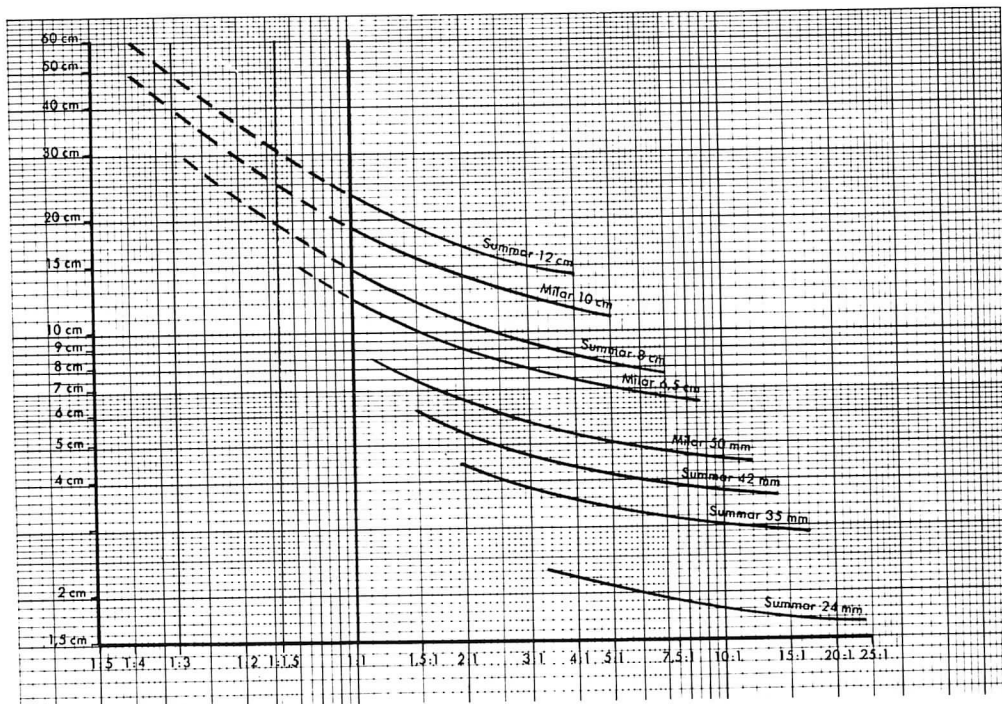
For detailed information see instructions of the Universal Lamp Housing 250.

Diagrams for Macrophotography

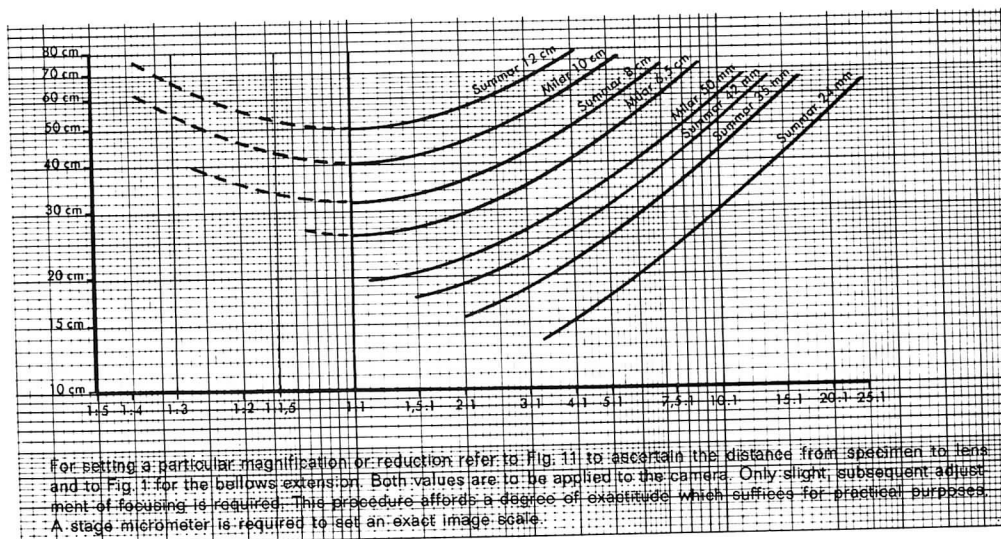
Bellows extension



Distance from specimen to lower rim of lens mount

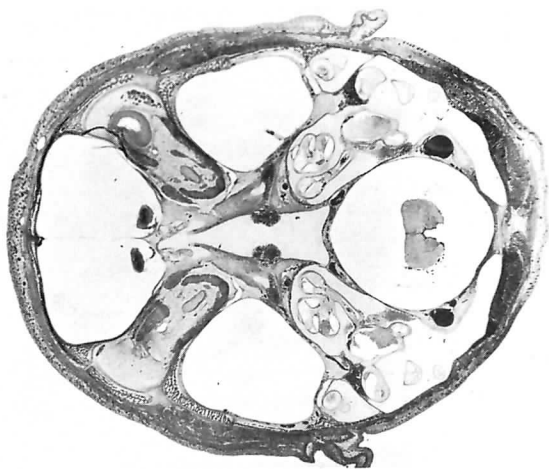


Total distance specimen to film plane

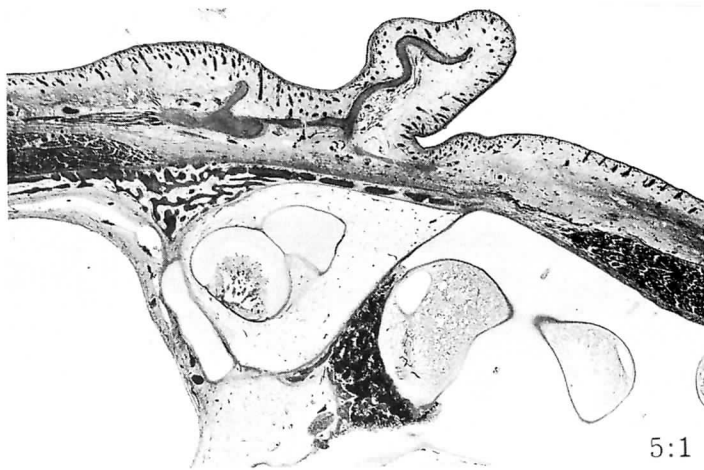


Depth of Field Versus Magnification and Diaphragm Setting

4"x5" format, circle of confusion 1/10 mm		
Magnification	Depth of Field with F/stop 8	Depth of Field with F/stop 16
0.5:1	9.60 mm	19.20 mm
1:1	3.20 mm	6.40 mm
5:1	0.384 mm	0.768 mm
10:1	0.084 mm	0.168 mm
30:1	0.055 mm	0.110 mm
LEICA format 24 mm x 36 mm, circle of confusion 1/30 mm		
0.15:1	24.78 mm	49.56 mm
0.3:1	7.00 mm	14.01 mm
0.6:1	2.15 mm	4.31 mm
1.5:1	0.539 mm	1.08 mm
3:1	0.216 mm	0.431 mm
6:1	0.094 mm	0.189 mm
9:1	0.060 mm	0.120 mm



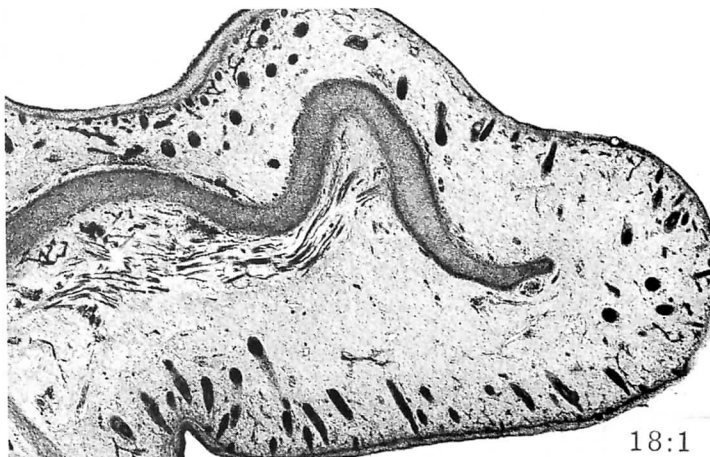
1:1



5:1



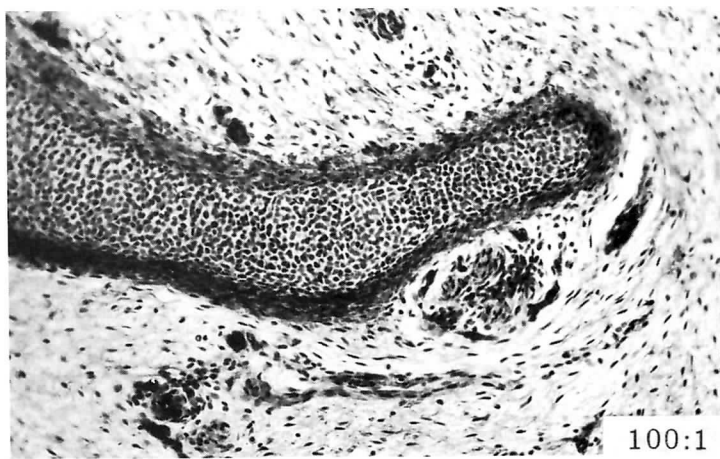
10:1



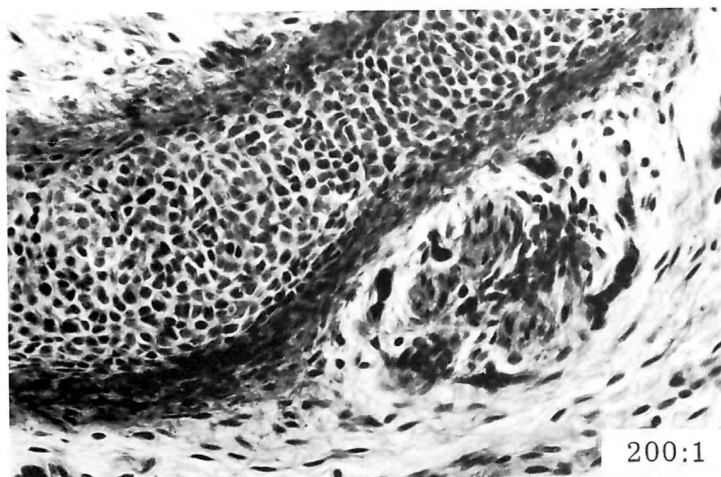
18:1



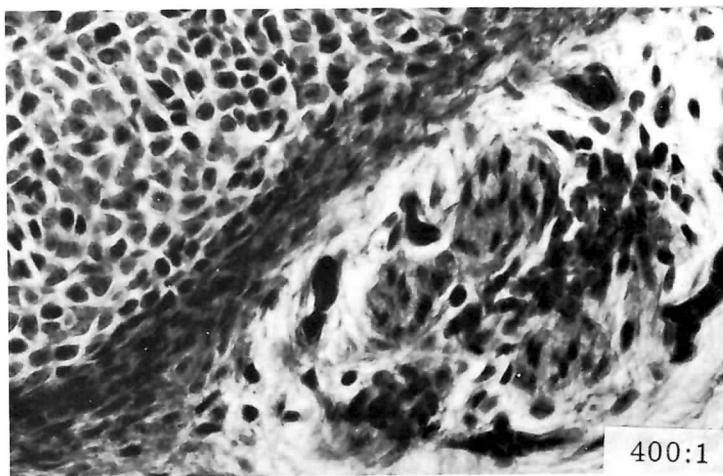
40:1



100:1



200:1



400:1