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## Prof. Gullstrand's

# Slit Lamp

### Directions, Med 135.

To be read in conjunction with

**Med 111** Description of the Slit Lamp
**Med 4** Description of the Corneal Microscope, or
**Med 131** Description of the Eye Microscope and
**Med 134** Directions for the Eye Microscope
**Med 133** Bibliography.

Attention is also drawn to the comprehensive theoretical and practical expositions given in the following treatises:

**L. Koeppe:** "Die Mikroskopie des lebenden Auges", Vol. 1. "Die Mikroskopie des lebenden vorderen Augenabschnittes im natürlichen Lichte". J. Springer, Berlin, 1920; 310 pp., 62 illustrations (in the following pages these illustrations are referred to by the prefix "**Mi**".

— — "Die ultra- und polarisationsmikroskopische Erforschung des lebenden Auges und ihre Ergebnisse"; E. Bircher, Berne and Leipzig, 1921, 269 pp., 74 illustrations (referred to by the prefix "**Po**" in the following pages).

— — "Die Bedeutung der Gitterstruktur für die Theorie der subjektiven Farbenerscheinungen in den lebenden Augenmedien". E. Bircher, Berne and Leipzig, 1921, 21 illustrations.

**A. Vogt:** Atlas der Spaltlampenmikroskopie des lebenden Auges (German, English, French, Italian), mit Anleitung zur Technik und Methodik der Untersuchung. J. Springer, Berlin, 1921. 370 figures.

### Manner of Setting up the Slit Lamp.

(1) **Figs. 1—2, Med 111.** Place the stand on the plate of the swing-out double arm of the instrument table and secure it thereon by means of the three screws. The socket pin on the upper part of the slit-lamp should be slipped into the pillar and fixed therein by means of the screw at the side. Attach the chin and head rests on the long side of the table.

(2) Fix **the Slit Lamp Bracket** in the extended stand column by means of the clamping screw at the side (Fig. 2, Med 111). At the end of the arm put in position the slit lamp lens (with the rectangular stop facing the slit) and fix it, when adjusted, with respect to the optical axis (likewise by means of the clamping screw). The optical axis of the lens should be about 44 mm. above the slit-lamp bracket.

(3) Use the slit lamp lens of **7 cm.** focus of the Vogt or Koeppe type, with a stop of 16×10 mm. In addition to this stop the Koeppe lens has supplementary stops of 13×9 and 9×6 mm., the latter being principally required for ultra-microscopic investigations. The Koeppe slit-lamp lens of **10 cm.** focus with the same set of three stops furnishes a still more elongated and pointed pencil of light (for the microscopic examination of the chamber angle). Our ophthalmoscope lens of 50 mm. free aperture and 7 cm. focus, on the other hand, furnishes a broad pencil of light. When placing this aplanatic non-spherical lens in position make sure that the more deeply curved side faces the slit lamp; also, the slit-stop should be on this side of the ophthalmoscope lens.

(4) The **silvered mirror** should be used when it is necessary to introduce an acute angle between the axes of illumination and that of observation (as when viewing the chamber angle, the more deeply seated layers of the vitreous humour, and the fundus oculi). It is also required for ultra-microscopic observation and with the polarising microscope.

The two figures 1 to 2 show the manner in which the mirror is to be attached. The position of the mirror may be altered by means of the flexible holder and the ball-and-socket joint (Fig. 1). The silvered mirror (Fig. 2) may be turned about its vertical axis and is also inclinable about its horizontal axis. After releasing the small clamping screws

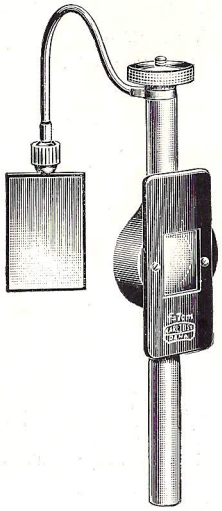

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Fig. 1. Vogt Slit Lamp Lens with silvered mirror attached to flexible holder.

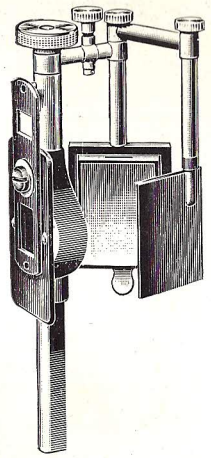

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Fig. 2. Koeppe Slit Lamp Lens with silvered mirror attached to adjustable holder.

above the slit-lamp lens it may be swung from one side of the lens to the other. With the blackened plate a portion of the pencil of light can be cut out altogether.

As a rule, the mirror should be situated 2 to 3 cm. behind the slit-lamp lens. Its angular position with respect to the lens is governed by the required direction of incidence of the light upon the mirror and the eye.

The reflecting surface must not be touched under any circumstances! When not in use, the mirror should be covered up with the paper sheath. Every 6 to 12 weeks the mirror requires re-silvering. It is for this reason advisable to provide a spare mirror. In the case of the mirror shown in Fig. 2 one silvered glass plate is sufficient as a reserve, since the plates are interchangeable within the frame.

(5) The **Screen Tube** on the slit-lamp bracket (Fig. 1 to 2, Med 111) is provided for keeping off any adventitious light. When the polariser is not in use it should be about 5 mm. from the lamp-slit. It should be firmly mounted on the slit-lamp bracket and secured in position by the screw at the side (Fig. 1, Med 111). It will then be properly adjusted for height with respect to the optical axis of illumination. If, after the adjustment of the luminous source, the pencil of light does not pass through the middle of the circular front stop, this may be corrected by a slight lateral displacement of the screen tube.

(6) The red and orange components of the slit-lamp light are to be eliminated by the use of the Vogt **Red-absorbing Filter** (which comprises wave-lengths ranging from 600 to 420 μμ). It is made in the form of a single attachment fitting the holder at the end of the screen-tube furthest away from the slit. A redless filter of this kind is also contained in the Koeppe **revolving coloured glass disc.** The additional two pairs of yellow and blue filters contained in the disc furnish a more monochromatic light.

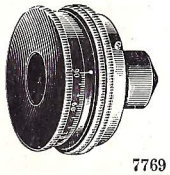

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Fig. 3. The Polariser with scale, index, and circular front stop.

(7) The end of the screen-tube facing the slit is made to receive the revolving **polariser** for observation with the polarising microscope. To this end the front stop should be removed from the screen tube and replaced by the polariser (with bayonet catch) in such a manner that the index is at the top. The position of the polarising plane is indicated on the mount by a white enamelled line which can be seen in the dark. A graduation in degrees and an index admit of the position of the plane of polarisation corresponding to the rotations of the polariser being read off.

When using the polariser the adjustment of the screen-tube with respect to the optical axis of illumination is particularly important (cf. art. 5). To protect the polariser from undue heating the screen tube should be 15 to 20 mm. (instead of 5 mm.) from the slit of the slit-lamp.

## Putting in a Nernst Burner or a Nitra Lamp.

(8) **Fig. 4.** Slip the resistance (1) (with the point outward) between the two springs (2) arranged within the three contact studs in such a manner as to ensure that the resistance may make good contact with the contact springs (2). Place the Nernst burner (3) upon the three studs so as to ensure its correct position. Screw the lamp fitting into the casing (4), after withdrawing the three screws (5) sufficiently far. Again screw up firmly so that the burner may be in the middle of the tube.

The Nernst burner consumes about 0.5 amp. and about 15 to 20 volts less than the supply voltage, the difference being absorbed by the resistance (1). When the current has been switched on it takes a few minutes until the burner is sufficiently hot for the glower to shine brightly.





(9) **Fig. 5.** Screw the Nitra lamp (1) into the lamp fitting (2) and introduce it into the lamp tube (3). Tighten the two screw threads firmly. Screw the two small screws (5) alternately in and out so as to adjust the Nitra lamp in the middle of the tube (3).

When switching on the Nitra lamp (for the first time) the slider of the regulating resistance should be placed over "start". The hot wire of the lamp will then only glow faintly. The slider should then be moved to the other side ("full on") of the resistance until the wire is white-hot, presenting a somewhat broadened appearance. The resistances are set by us for the stated voltage by a stop which arrests the slider when it is in its proper position.

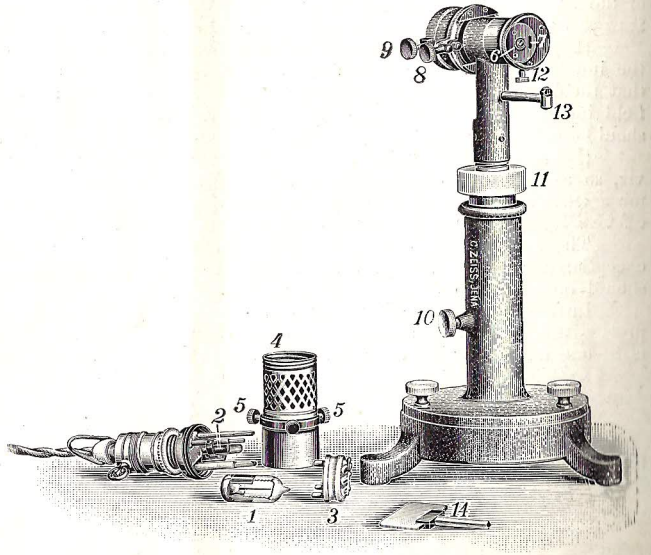


Fig. 4. The Slit Lamp with dismembered Nernst lamp. 531

## Adjustment of the Glower.

(10) Turn the rotating wheel diaphragm (6) (Fig. 4) at the end of the slit-lamp tube into such a position that the slit aperture (7) may be in front of the slit of the slit-lamp. After replacing the screw, on the side opposite the screws (8) and (9), turn the slit lamp tube into such a position that the slit (7) may be vertical. The clamping screw should then be tightened. Whilst adjusting the slit, open it sufficiently wide by means of the screw (12). The slide (8) should be in a mean position. Release the screw (9). The room should be darkened.

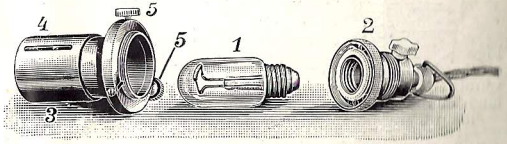


Fig. 5. The Nitra Lamp for the slit-lamp, shown dismembered. 7795

(11) **The Nernst Burner.** Hold a sheet of white paper about 15 cm. in front of the slit (7). With the filament in a vertical position indroduce the Nernst lamp into the slit-lamp tube up to the stop. After switching on the current, a bright band of light will be seen within a dark field (Figs. 6a and b).

Turn the Lamp a little within the slit-lamp tube and note the position in which the strip of light appears to be narrowest. When this is the case the **slit and filament** will be **in the same direction.** Fix the position by tightening the screw (9).

By displacing the slide, with the aid of screw (8), direct the strip of light into the middle of the luminous field, i. e. into the optical **axis of illumination** (Fig. 6 b).

Again release the screw (9), and, without turning the lamp, withdraw it slowly from the slit-lamp tube until the strip of light on the paper expands to the size

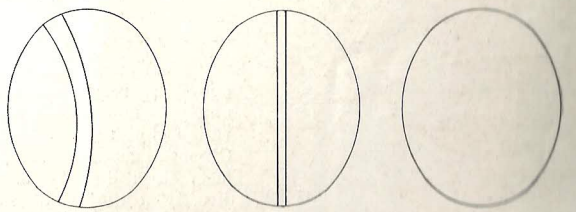


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Fig. 6. The luminous field and the image of the filament as they appear during the adjustment of the Nernst burner.

of the former faintly illuminated oval, the latter being uniformly bright (Fig. 6c). A **sharp image** of the filament will then appear within the slit.

(12) Coloured fringes are of no consequence: but there should be no dark spots within the luminous field. Two dark spots on either side of the axis of the luminous field signify that the lamp has been pulled out too far or not far enough; a dark spot at the side of the field indicates that the filament is not exactly in the optical axis of illumination, and it should in this case be slightly displaced by means of the slide (8).

(13) **The Nitra Lamp.** The Nitra lamp may be adjusted in position in two ways, viz, so as to form an image of the luminous spiral **upon the slit-lamp lens** (adjustment for a ***narrow*** pencil of light) or so as to form an image of the filament **within the slit of the lamp** (adjustment for a ***wide*** pencil of light).

The former mode of adjustment should be adopted as a rule with the Nitra lamp. In exceptional cases only, e. g. when using the ophthalmoscope lens (art. 3), the second mode should be resorted to.

Introduce the Nitra lamp into the slit-lamp tube as far as it will go. During the process the Nitra lamp should be so held that the luminous spiral may be ***vertical*** (that is in one direction with the slit). Screw (9) should then be tightened.

### Projection of the Image upon the Slit-lamp Lens.

(14) Place on the slit-lamp lens a piece of white paper. Withdraw the lamp slowly from the sleeve fitting (4), which is clamped within the slit-lamp tube by means of the screw (9) (Figs. 4 and 5), by a sufficient amount to cause a much magnified image of the luminous spiral to appear on the paper (Fig. 7). To determine the exact point when the image of the luminous spiral has its greatest sharpness the lamp should be moved a little backward and forward.

When the image of the luminous spiral is not vertical (and hence not parallel to the long side of the diaphragm of the slit-lamp lens) all that is necessary is to release screw (9) and to turn the lamp a little within the slit-lamp tube; after which the screw (9) should be re-tightened. In the event of the image of the spiral not coinciding with the middle of the slit-lamp lens, the slide should be slightly displaced by means of screw (8).

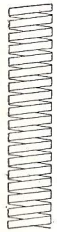

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Fig. 7. Image of the luminous spiral of the Nitra lamp on the slit-lamp lens

### Projection of the Image into the Slit.

(15) The adjustment is the same as in art. 11, except that in this case, when withdrawing the lamp from the slit lamp tube, the clamping screw (9) should remain firmly tightened, so that the sleeve fitting (Fig. 5) may not be displaced. In this mode of adjustment of the Nitra lamp the focal field of light occasionally exhibits fine horizontal streaks of colour; by bringing the slit-lamp lens slightly nearer to the eye these may be removed. In the case of the adjustment of the Nitra lamp, as described in art. 14, these disturbing streaks do not arise.

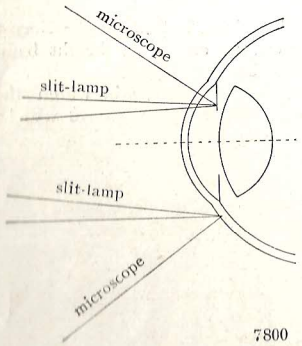


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Fig. 8. Observation of the iris and conjunctiva by direct (incident) light, Koeppe: **Mi** p. 39.

### Modes of Illumination.

Various modes of illumination are applied alternately in microscopic observation by the slit lamp. Observations are made, in fact, in a directly or indirectly illuminated field, in an oscillatory field, in a reflected field, and in dark-ground illumination.

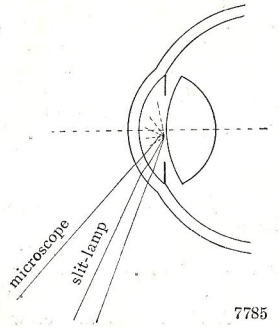


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Fig. 9. Observation of the aqueous humour by diffusely reflected and diffracted light (indirect illumination), Koeppe: **Mi** p. 39, and **Po** Plate VIII.





between the axes of observation and illumination. Angles of intermediate magnitude will be sufficient for these observations. To obtain as acute an angle as possible between the axes of illumination and observation the slit-lamp and the corneal microscope should be adjusted as indicated in the diagram Fig. 12. The microscope and slit-lamp bracket should be more or less at right angles to each other, and the silvered mirror should be placed in a slightly inclined position above the mean axis of observation of the corneal microscope, the binocular tube of the microscope being tilted upwards by a corresponding amount.

In this way a sufficiently acute angle in the adjustment of the axes of illumination and observation is obtainable with the corneal microscope, even within the vitreous humour and the fundus. The local range is rather restricted, so that the corneal microscope confines observation to small regions. As a means of examining the anterior layers of the eye by natural slit-lamp light the corneal microscope has over the eye microscope with single objective the advantage of a greater light-transmitting power and a more pronounced stereoscopic effect.

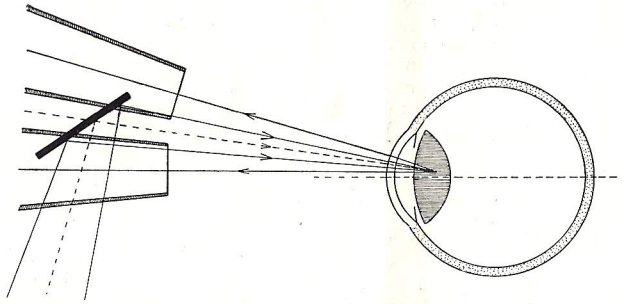

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Fig. 12. Corneal Microscope focussed upon the lens.

(19) *In all these adjustments the aim should be to view with the microscope axis directed radially upon the cornea, this being the best means of obviating disturbing reflections and defects in the resulting images. When, however, a case arises where it is necessary to observe obliquely with respect to the cornea, it will be sufficient after a little practice to apply a very slight change to the angle of incidence of the illumination in order remove the trouble. The adjustment should be practiced first at low magnifications, that is to say, with an objective a, and eyepiece 2 (see plates in Med 131 and Med 4).*

### Focal Adjustments.

(20) **The Conjunctiva.** Direct and indirect illumination (the latter especially in morbid conditions of the conjunctiva). Walls of blood vessels are seen best in direct light, their contents (moving blood cells) in indirect light; the region of the limb in indirect light. For viewing blood vessels Vogt's red-absorbing filter should be used, the yellow glass for viewing lymphatic vessels and special peculiarities of tissues. All magnifications up to 108 × should be used.

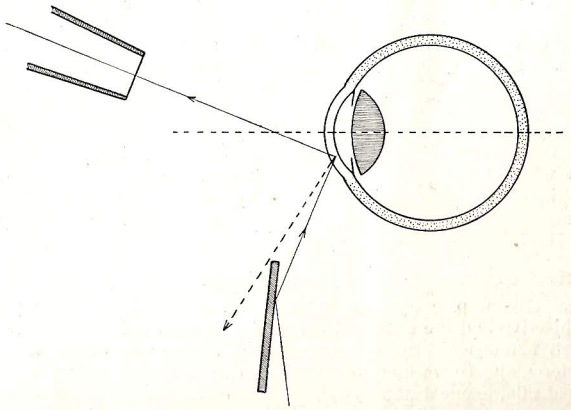

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Fig. 13. Focal Adjustment upon the cornea without eye adhesion glass; Koeppe: **Mi** pp. 106—108, and **Po** Plate XX.

(21) **The Cornea.** All modes of illumination are available. When using dark ground illumination the pencil of light should be incident from the side, so as to cause the pencil of light to meet the extreme region of the iris at a spot opposite the point where the pencil meets the cornea (i. e. when the incidence is on the temporal side that spot will be in the neighbourhood of the nasal chamber angle, Fig. 11). When the annular eye adhesion glass is used the pencil of light

(16) When the microscope has been focussed upon a focally illuminated spot, for instance on the surface of the cornea, if this object is then viewed within the sharply defined boundary of the brightly illuminated slit image, and if the hand controlling the focussing adjustment of the slit lamp lens is made to effect small changes in the focus, it will be noticed that the individual peculiarities of the tissue are not always in brightest distinctness when the focal pencil of light is made to fall **directly** upon it, but also exceedingly fine tissue elements immediately adjoining the boundary of the bright slit image are recognised in diffracted and diffusely reflected light **(indirect illumination).** It is therefore an advantage to make the observation by a moving pencil, i. e. in an oscillatory field. The hand by which the slit lamp lens is focussed should be made to execute small side-to-side and also up-and-down movements, so as to afford alternate observation by direct and indirect light. This will cause exceedingly fine structural details to suddenly flash into view and again disappear, and the simulated movements of the particles disclose their presence much more quickly and with greater precision than observation under a stationary illumination. The connection to the slit-lamp bracket by a socket pin affords sufficient scope for movement.

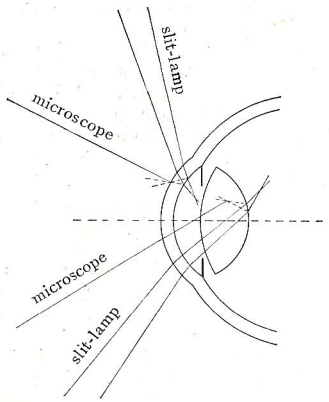

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Fig. 10. Observation on the cornea and lens within the region of reflected pencils (in the focus of reflection by Vogt's method); Koeppe: **Mi** p. 57, 58, and **Po** Plate XIII.

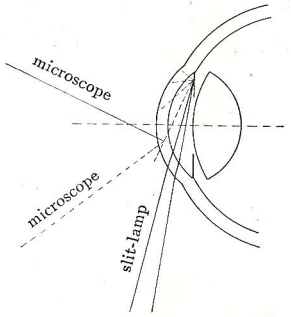

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Fig. 11. Observation on the cornea under dark ground illumination (full line representing axis of microscope); in a negative bright field or transmitted light (dotted line representing axis of microscope); Koeppe: **Mi** pp. 40—41, and 106—108, and **Po** Plate VIII.

(17) Indirect illumination is to be distinguished from observation within the **region of reflected pencils** by Vogt's method. By this latter method the axis of illumination is not adjusted to the apex of the focal pencil of light but to its reflected image.

Considerable importance attaches also to observation by **dark ground illumination.** In this latter mode of observation the pencil of light is neither directed immediately upon the spot which is to be examined, nor is the latter viewed by the indirect light of the brightly and sharply illuminated adjoining region, instead of which the light is concentrated more or less behind the elements of tissue to be examined and the actual observation made with the light reflected therefrom. By this system of illumination no ray contributing to the illumination, if produced along the rectilinear line, may enter the microscope, and it is only the diffracted and diffusely reflected rays which go to form the image. The axis of the microscope should be approximately at right angles to the axis of illumination. When the angle is considerably more obtuse than a right angle the resulting illumination is a **negative bright-field illumination,** in which the particles appear dark on a bright ground. The observation by dark ground illumination is less straining to the eye than the other methods of observation; and there are no entoptic appearances, such as are liable to arise when observations are made by direct light.

## Examination by natural Slit-lamp Light.

(18) Observations by natural slit-lamp light may be made by means of the **Koeppe eye microscope** with a single objective and the **corneal microscope** with paired objectives. The modes of observation outlined below refer in particular to the application of the ultramicroscope and the polarising microscope (for which the Koeppe eye microscope) is needed. By similar adjustments the corneal microscope is, however, available for the examination by natural slit-lamp light of individual portions of the eye and its layers, though it will not likewise be possible, or necessary for that matter, to establish a precise or very acute angle





should be made to enter at angles of 30 to 40° on the temporal or nasal side. By reflection at its intermediate layer an elongated grazing pencil is formed strictly within the cornea, with the result that when the axis of observation is at right angles to it the tissue will be seen by true dark ground illumination. By approaching the silvered mirror or the slit lamp lens to the adhesion glass and establishing a more or less lateral illumination, the position and length of the pencil of light may be varied within the cornea.

All magnifications up to 108× may be applied. All disturbing corneal reflections should be obviated by setting the axis of the microscope radially to the cornea; or, where this is not possible in view of other conditions which have to be satisfied, the reflections should be removed by applying slight changes to the illuminating angle. The annular eye adhesion glass should be applied in a similar manner as the fundus glass and chamber angle glass (arts. 24 and 27).

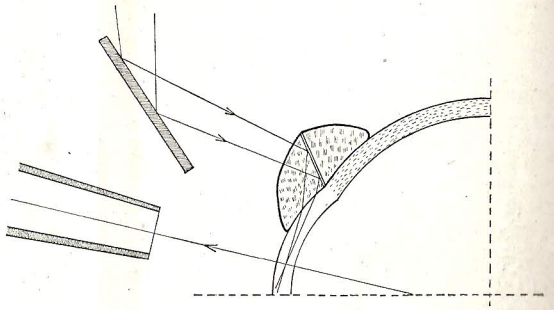
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Fig. 14. Adjustment upon the cornea viewed by dark ground illumination in conjunction with an annular eye adhesion glass. Koeppe: **Po** Plate XXIII.

(22) **The aqueous humor.** Use direct and indirect illumination, applying slight oscillations.

(23) **The lens.** Apply dark ground and oscillatory illumination. Use a yellow glass to obviate an excess of light and to bring into view fine differential grades in the brightness of barely visible particles. A blue glass and a red-absorbing filter should be employed to ensure a finer gradation between light-yellow and dark-brown pigmentary elements, the latter appearing nearly black, whilst the former almost disappear amongst surroundings of similar colour. The illumination is best applied from the temporal side.

(24) **The Chamber Angle,** Fig. 16. Manner of applying and removing the eye adhesion glass: The adhesion glass, which should be kept in 80% alcohol, after rinsing with water, should be filled with physiological salt solution of the ordinary temperature and then applied to the patient's eye, directing him to look down and then straight on, whilst the left hand should retract the eye-lids. It is necessary to cocainise the eye. Eserin should be instilled half an hour previously to ensure a sufficiently taut and flat iris, the cocainisation notwithstanding. In case of need a band should be tied around the patient's head so as to support the lower lid with the glass. The adhesion glass may be detached by means of an iris spatula applied from the temporal side whilst the eye is being made to look in a nasal direction.

The patient should be directed to look straight ahead, say 45° to the principal direction, i. e. to the centre-line of the instrument table. The chin rest should be turned accordingly, and, if interfering, the head-rest may be detached. The Koeppe slit lamp lens of 10 cm. focus is best adapted for this purpose, in that it furnishes a long flat pencil of light. Use Objective $a_1$ together with Eyepieces 2 and 3.

(25) **The Eye Lens.** Observation may be made by direct illumination and within the region of reflection (Fig. 10). With deep-seated layers it is not possible to set the axes of illumination and obser-

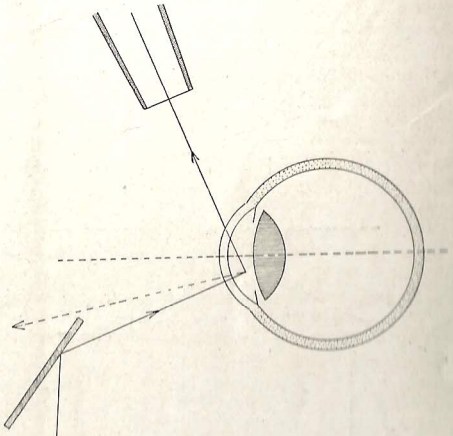
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Fig. 15. Focal Adjustment upon the aqueous humour. Koeppe: **Po**, Plate XXIV.

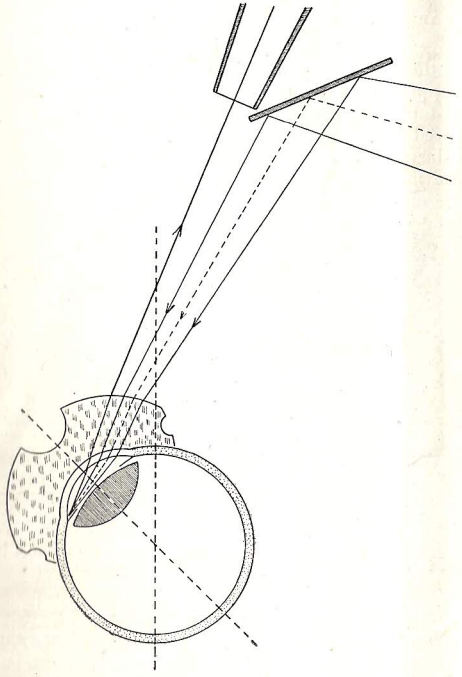

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Fig. 16. Focal Adjustment to the nasal chamber angle of the right eye in conjunction with the eye adhesion glass. Koeppe: **Mi**, pp. 296—301.

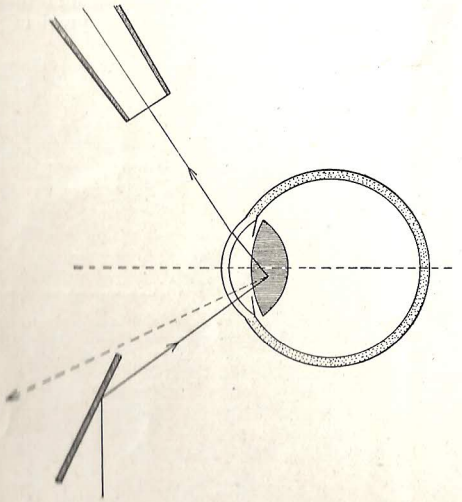

Fig. 17. Focal Adjustment upon the lens. 7778
Koeppe, **Po**; Plate XXV.

vation at right angles to one another, and in this case the angle should be made as acute as possible, Fig. 17.

(26) **The Vitreous Humour.** Apply direct, oscillatory, or dark ground illumination (indirect illumination being very faint). The posterior third of the vitreous humour can only be observed by setting the axes of illumination and observation to a very acute angle. The region of the normal vitreous humour immediately in front of the retina cannot be resolved since the normal tissues of the vitreous humour are drowned in the bright light of the slit image on the retina. The examination succeeds only when there are morbid opacities. No eye adhesion glass should be used.

(27) **The Fundus of the Eye.** The mirror should be 2 to 3 cm. from the eye and 3 to 4 cm. from the slit-lamp lens. Magnifications may be as high as 62.5 or 65×. Apply direct, and more so indirect, illumination, also dark ground illumination, a blue glass, white light, and red-absorbing filter; Fig. 19.

Eye Adhesion Glass: Fill the inner cavity with physiological salt solution. Apply the glass to the cornea of the patient's eye, using atropine and cocain and retracting the lids with two fingers. During this operation the patient's head should be inclined forward. Take off with the aid of an iris spatula.

(28) *Figs. 13, 15 and 17 show in all cases only the setting at a right angle and very acute angle of the axes of the microscope and the illumination (The acute angular setting of the microscope axis is shown in dotted lines). For the purpose of comparison all other angles should, of course, be applied ranging from the right angle to the extreme acute angle.*

## Points to be observed in the Management of the Apparatus.

(29) The room should be completely darkened. The glass slab on the instrument table should likewise be covered with a black cloth, provided with a slit and row of buttons for the microscope to pass through. Naturally, it is also important to ensure a good dark adaptation of the eyes.

(30) The oculist should grip the stand of the microscope by the screw nut (Figs. 1 and 2 in Med 111 or Med 131) with the ball of the thumb and the third, fourth and fifth fingers, whilst the thumb





and index finger should attend to the focussing gear of the microscope. The other hand is then free for the adjustment of the slit pencil upon the eye, the thumb and index finger being applied to the motion screw of the slit-lamp lens. Thanks to the freedom with which the table bracket and the slit-lamp arm move (when the clamping screw on the stand below the arm is released) it is easy to follow the slightest movements of the patient's eye.

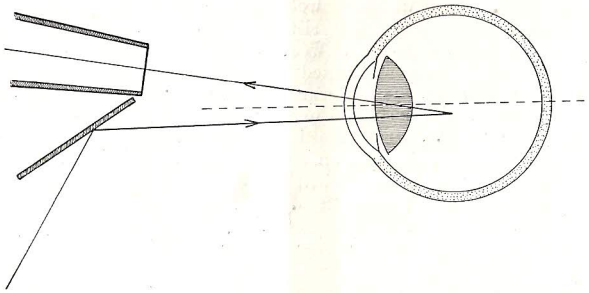

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Fig. 18. Focus Adjustment upon the Vitreous Humour. Koeppe **Po**, Plate XXV.

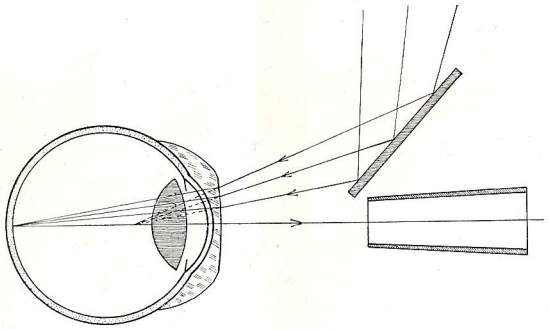

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Fig. 19. Focal Adjustment upon the Fundus of the Eye in conjunction with an Eye Adhesion Glass.

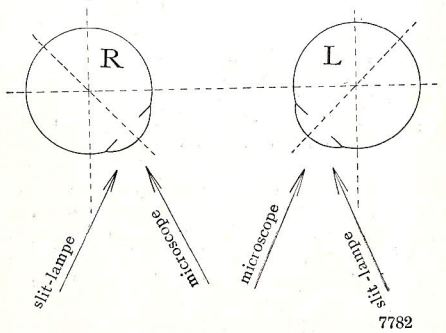


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Fig. 20. Illumination from the temporal side. In the examination of the right eye the microscope should be served by the right hand of the oculist, the slit-lamp by the left hand. The reverse applies to the left eye.
Koeppe, **Mi**, pp. 33 to 37.

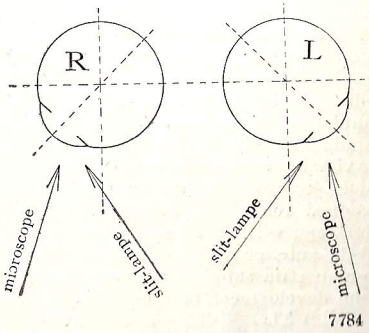


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Fig. 21. Illumination from the nasal side (over the ridge of the nose). In the examination of the right eye the microscope should be served by the left hand of the oculist, the slit-lamp by the right hand. The reverse applies to the left hand.
Koeppe: **Mi**, pp. 33 to 37.

## Localisation in Depth of the Elements under Observation.

(31) The focal pencil of light transmitted through the rectangular stop of the slit-lamp lens is in the form of an elongated truncated pyramid, the apex of which, i. e. the image of the slit, constitutes the brightest focal region of the pencil. By causing the pencil of light to penetrate into the eye as far as the vitreous humour an optical section is obtained through the anterior portion of the eye, which is well adapted for general orientation. For more exact observation and for localisation the slit image requires in every case to be sharply focussed upon the layer which is to be viewed. To this end the focal portion of the pencil of light should, for example, be concentrated upon the **surface of the cornea,** so that the bright edge of the slit image may appear in sharp outlines on the surface of the cornea (1). The slit image should then be made to appear at a slightly deeper stratum, viz. on the posterior corneal surface (2), until the bright edge can be distinctly seen there. To localise an element, such as a point-like opacity, impart small to-and-fro movements to the slit lamp arm and watch for the instant when the element appears or disappears within the space comprised between the two bright edges. If its appearance or disappearance occurs at the anterior bright edge it follows that it lies on the front surface of the cornea (1). If, however, the point appears somewhere between the two bright lines the inference is that it is situated within the substance of the cornea. In this case the ratio of the two distances from the edges may be determined micrometrically.

Similarly, the position of linear elements, such as fold lines, nerve filaments, vessels, superficial opacities, may be ascertained. Their position may be located by determining the point of intersection of these lines with the bright edges.

Within the **lens** the surfaces of discontinuity furnish a means of localising the elements. The anterior and posterior capsules may be rendered directly visible, and the position of cortical opacities determined with respect to the capsule. The focal adjustment upon the anterior capsulo-lenticular stria is facilitated by the anterior granulation of the lens. The granulation may be brought into view by causing the patient to look towards the source of light till the radius of the capsular region which is to be examined roughly bisects the angle between the axes of illumination and observation. The microscope will then be in a principal direction of the emergent light reflected by the lens and the anterior region of reflection of the lens will be in focal adjustment. A sharply defined capsular stria supplies an important optical localising element for the clinical investigation of the development of a cataract.

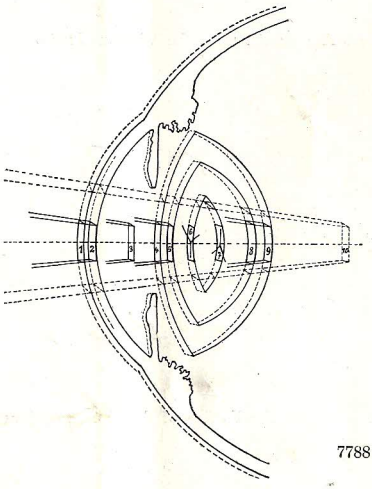


Diagram indicating the positions of the focal slit-images

1. On the anterior surface of the cornea;
2. on the posterior surface of the cornea;
3. on the aqueous humour;
4. on the anterior surface of the lens;
5. on the anterior senile surface of the nucleus;
6. on the anterior and
7. on the posterior embryonic nuclear layer;
8. on the posterior senile nuclear layer;
9. on the posterior lens surface;
10. within the vitreous humour.

Fig. 22. Adjustment of the focal pencil of light upon the boundary surfaces of the different layers of the eye and the method of accurately localising the observed elements. A. Vogt: cf. Untersuchungen über moderne fokale Beleuchtungsmethoden. Schweiz. medizin. Wochenschrift 1920, No, 29. Id.: "Die Sichtbarmachung des lebenden Hornhautendothels", Graefes Arch. f. Ophth. 1920, Vol. 101, p. 123.

(32) The slit-lamp is also available for use with the ordinary **ophthalmoscope** (the slit-lamp bracket being detached for this purpose, Fig. 4). The illumination should be applied in the manner described in art. 10 or 14 and shown in the diagram Fig. 6c. The slit-lamp may likewise be employed in **skiascopy** by using an uncoated mirror (Fig. 3 in Med 111) and for **stigmatoscopic** examination, in which case the uncoated glass wedge plate 14 should be inserted in the holder 13 (Fig. 14).