POSER SLIT LAMP

BAUSCH & LOMB OPTICAL CO. ROCHESTER, N.Y. U.S.A.

REFERENCE MANUAL

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Cat. No. 71-61-38

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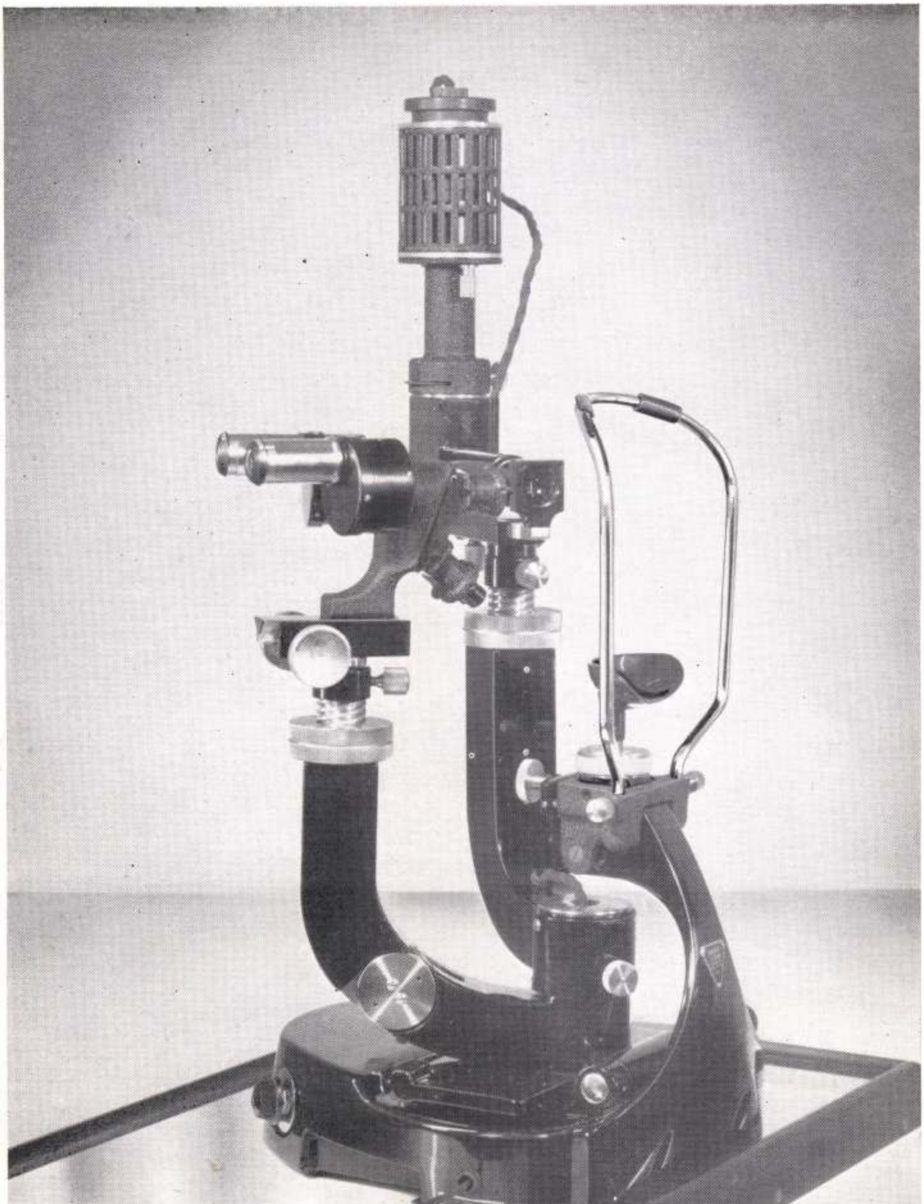

Figure 1
The Bausch & Lomb Poser Slit Lamp.

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Figure 2

The Bausch & Lomb Poser Slit Lamp mounted on the DeLuxe Instrument Stand.

CHAPTER I

A Clinical Aid to Diagnosis in Ocular Diseases

Slit Lamp examination, or bio-microscopy, is today the only certain procedure by which a differential diagnosis may be made in many cases of eye pathology. It has two very important uses: localization and bio-microscopy.

In modern ophthalmic practice, there are often the questions:

Whether pathology is old or recent;

Whether it is traumatic or non-traumatic in origin;

Whether an incipient corneal process is due to congenital syphilis or to some other cause;

Whether an iritis is due to one etiologic factor or to another;

Whether the crystalline lens is in situ;

Whether a cataract is senile in origin, complicated, or due to trauma;

Whether the fellow eye presents any evidence of sympathetic ophthalmia.

In the past, answers to these and many other questions have often involved a degree of uncertainty. To-day, however, certainty and precision result from the use of the bio-microscope or slit lamp microscope. Not only has early differential diagnosis been facilitated, but diseased processes can be followed throughout their course in minute detail by means of this instrument.

The narrow beam of the brilliant illumination of the Slit Lamp gives an optical section of the eye in any desired plane. It supplies the third dimension, which has so far been wanting in previous methods of eye examination, particularly in the cornea and the crystalline lens. Using the illumination system of the Slit Lamp with its critical focus, a very accurate localization can be made without any complicated calculations. With the Slit Lamp it is possible to investigate, with ample magnification, intense illumination and full stereoscopic vision, the structure of the cornea, the anterior chamber, the iris, and the lens.

Before the advent of the Slit Lamp it was necessary to guess at the depth of a foreign object in the eye. Now, by mere inspection, the examiner can localize the depth of a foreign body, scars or imbedded particles in the cornea. Under a magnification of approximately 26, the apparent thickness of the cornea is about 1 cm; it is obvious that it is not very difficult to divide the cornea into its important layers. No foreign body should be removed from the cornea without first localizing it with the Slit Lamp.

The earliest development stage of conical cornea can be detected easily with the Slit Lamp long before any change is visible with other apparatus.

The depth of the anterior chamber of the eye is a matter of importance, especially in glaucoma. This may be easily measured with the Slit Lamp. A knowledge of the contents of the anterior chamber is of supreme importance in any inflammatory state of the eye. The so-called "flare" of the anterior chamber is the earliest sign of uveitis and is a timely warning of the onset of sympathetic ophthalmitis. The detection of the circulation of these white blood cells is one of the first signs of sympathetic ophthalmitis.

The Slit Lamp is very important in determining the nature and the extent of a cataract which is being investigated for extraction. Valuable information may be obtained which may lead to an important modification of the extraction technique.

The Slit Lamp is a most important instrument in all medico-legal examinations. With it the eye doctor can be certain, for example, whether a perforating wound of the cornea is recent or old. Lesions in the lens can be chronologically dated and the results of the inflammation distinguished from vestiges of embryonic structures.

The Slit Lamp is no longer an exclusive research instrument—it is an indispensable part of every modern ophthalmologist's office equipment. It facilitates early diagnosis of eye lesions, gives better ideas as to prognosis, and is a very important aid in directly establishing lines of treatment in the course of the disease.

Slit Lamp examination or bio-microscopy is a comparatively recent addition to the examination procedures of the eye physician. The original Slit Lamp was designed about thirty years ago but the knowledge of the eye gained through examination with the Slit Lamp has added so much to the science of ophthalmology that the Slit Lamp is now indispensable to the examiner.

The rapidity with which the art of bio-microscopy has grown has made it necessary to design instruments that would enable the examiner to keep abreast of modern developments. Bausch & Lomb have accomplished this in their latest instrument, the Poser Slit Lamp.

Not only has it been necessary to construct a Slit Lamp to do the required work in bio-microscopy but it has been also necessary to design such an instrument so as to fit into the changes that have evolved in office procedure and instrumentation. Today office space is more limited and instruments must be devised that are more compact, more easily adjusted and used, less susceptible to mal-adjustment and still retain all the features required for accurate work. The new Bausch & Lomb Poser Slit Lamp is the answer to the demand for such an instrument.

The Poser Lamp is a self-contained unit that can be readily used on an instrument table or on the table of the instrument stands that are so rapidly coming into universal use (Fig. 1 and Fig. 2).

Many advancements in mechanical design have been incorporated in the new Poser Lamp. New light weight metals have been used so that the weight is negligible as compared to the sturdiness and rigidity of the instrument. The use of ball bearings

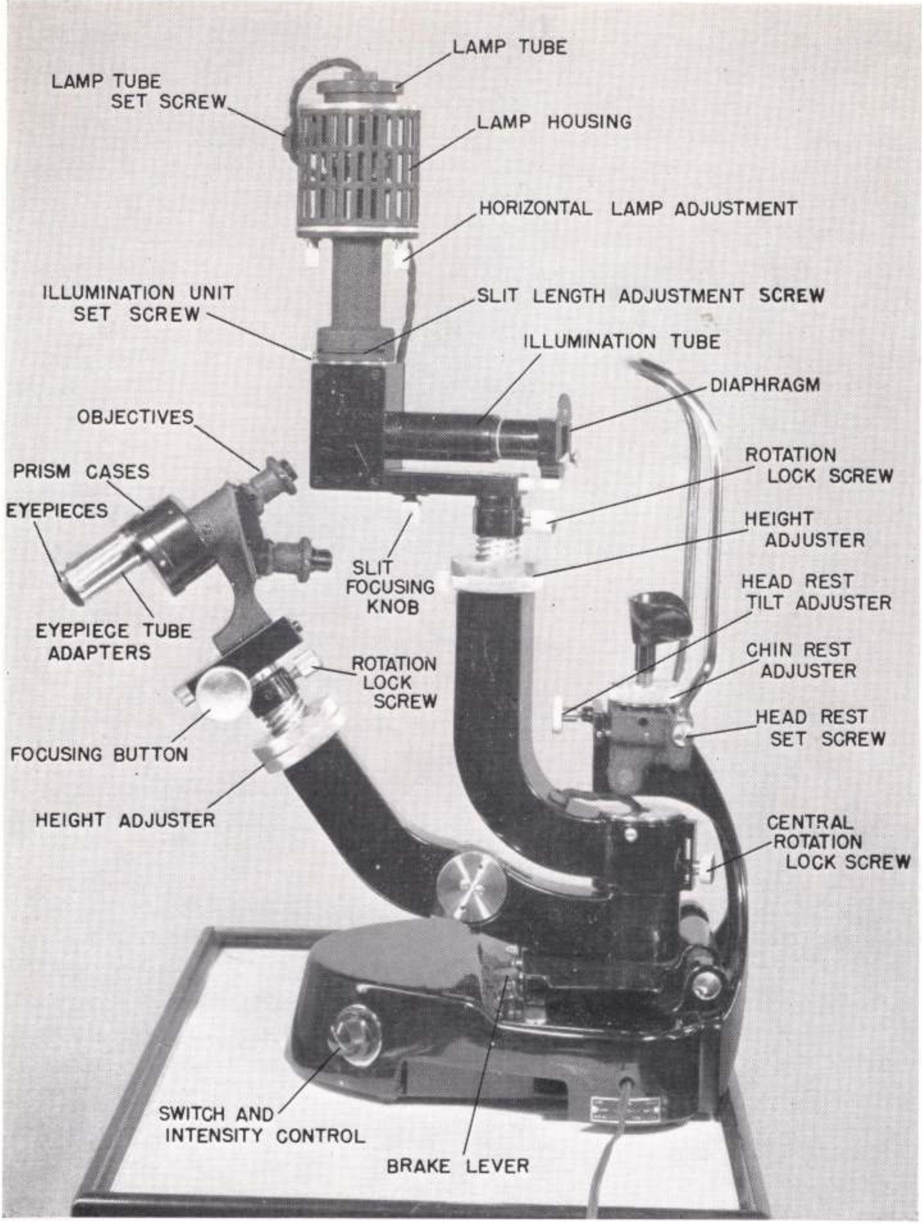

Figure 3

Reference Illustration of the Bausch & Lomb Poser Slit Lamp.

in many of the bearings makes rotation of the various arms permanently free. The illumination system and microscope are counter-balanced with coiled springs so that they can be raised or lowered by the slightest touch.

The illumination system has been designed about a standard 6 volt lamp and the required reduction in voltage obtained by a transformer built in the base. The switch and intensity control are one unit also incorporated in the base and readily accessible to the operator during the examination.

By properly mounting the microscope and lamp it is possible to rapidly, easily, and with practically no effort or inconvenience move the entire unit from one eye of the patient to the other without disturbing or moving the patient.

The slit lamp and microscope arms can be rotated independently about the same vertical axis or can be locked together so that they maintain the same angular relation to each other as they rotate. The common vertical axis can be positioned below the center of rotation of either eye.

All the adjustments that are required for the manipulation of the instrument during the examination have been carefully placed so that they can be operated with practically no change in the position of the operator's hand.

CHAPTER II

Instrument Specifications

The compactness of the instrument will appeal to all bio-microscopists, yet with that compactness there is no feeling of restriction as the various parts are manipulated during the slit lamp examination.

Standard equipment for the new Bausch & Lomb Poser Slit Lamp, catalog number 71-61-38-01, consists of the following:

	Catalog Number
1—Poser Slit Lamp	71-61-38
1—55 millimeter Paired Objective	71-61-46
2—10× Wide Field Eyepieces	31-15-54
2—6 volt Bulbs	42-42-23
1—Cover	71-61-76

The Poser Slit Lamp, catalog number 71-61-38-02, is the same as the above with the addition of:
1—40 millimeter Paired Objective—catalog number 71-61-50.

These two equipments can be used on alternating current only. For direct current there are two equipments similar to the above but with the addition of a convertor, catalog number 71-72-50 (Fig. 4). The D.C. equipments are cataloged as 71-61-38-11 and 71-61-38-12 and correspond to the 71-61-38-01 and 71-61-38-02 respectively.

The convertor is described under "Accessories for the Slit Lamp."

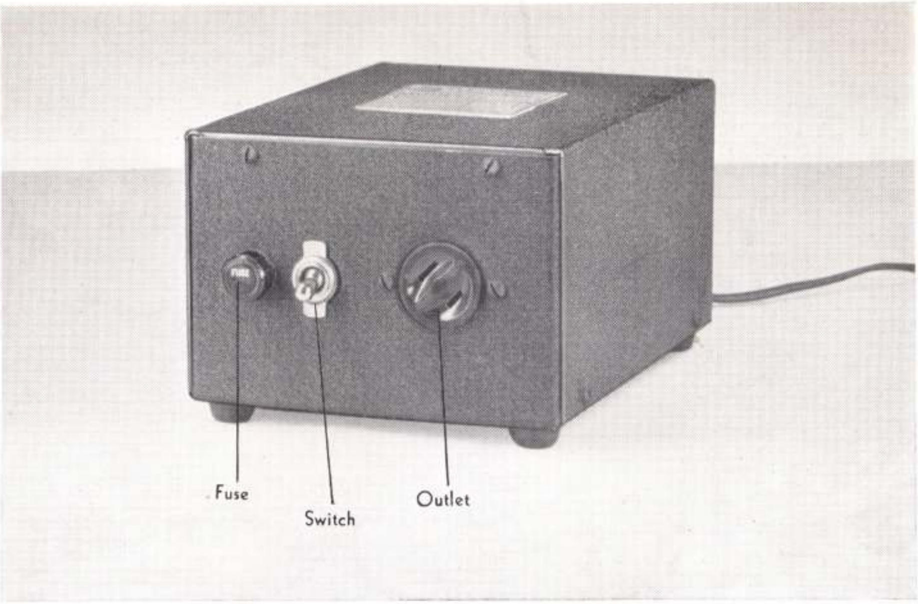

Figure 4

Electronic Convertor for changing direct current to alternating current, supplied with equipments No. 71-61-38-11 and No. 71-61-38-12. The convertor is the vibrator type with an average life of 3000 hours and should be turned off after every examination. A fuse is incorporated in the convertor circuit to protect the equipment from accidentally short circuiting. A burned out fuse can be removed by unscrewing the red cap with a screw driver or the edge of a coin. The fuse is a 6 ampere 25 volt glass tube fuse that can be obtained at any electrical or automobile supply store.

CHAPTER III

Unpacking and Assembly

The Poser Slit Lamp and its accessory equipment is shipped in one shipping case except for the direct current convertor. The convertor is shipped in a separate box.

For safety in transit the Slit Lamp is partially dismantled, the following parts being removed and wrapped or packaged separately. (In the following description refer to Fig. 3 unless otherwise noted.)

1. Head Rest
2. Microscope Body
3. Microscope Eyepieces
4. Microscope Objectives
5. Bulb
6. Lamp Tube
7. Lamphousing and condenser system
8. Accessories in their case

The lamp and microscope arms are tied to prevent movement during transportation.

The instrument is assembled in the following order, after the parts that have been tied together have been loosened:

1. Insert the headrest in its casting and tighten the HEAD REST SET SCREWS.
2. Insert microscope center post in the microscope arm.
3. Remove wrapping from the EYEPIECE TUBE ADAPTERS and EYEPIECES. Insert EYEPIECES in the ADAPTERS.
4. Remove wrappings from the revolving nosepiece and OBJECTIVES and slide the OBJECTIVES into their mounts. Stop screws have been placed in the objective mounts and nosepiece slides so that the OBJECTIVES will stop automatically in the proper position.
5. Place the LAMPHOUSE and condenser unit in position and tighten ILLUMINATION UNIT SET SCREW. This set screw should project at right angles to the prism mount as shown in Fig. 3.
6. Screw the lamp bulb into its socket in the LAMP TUBE.
7. Insert the LAMP TUBE in the LAMPHOUSING with the wire of the filament parallel to the ILLUMINATION TUBE.

After the instrument has been assembled the SWITCH AND INTENSITY CONTROL is turned counterclockwise as far as it will go and then the cord connector is inserted in a 110 volt electric outlet.

IF DIRECT CURRENT IS TO BE USED THE CORD FROM THE SLIT LAMP IS PLUGGED INTO THE CONVERTOR (Fig. 4) WHICH IS, IN TURN, CONNECTED TO THE D.C. OUTLET.

CHAPTER IV

Lamp Adjustment

After the Slit Lamp has been assembled the lamp filament must be adjusted correctly in order to obtain the maximum illumination. This adjustment is made in the following steps:

1. Turn on the light and set for fairly brilliant illumination by rotating the SWITCH AND INTENSITY CONTROL knob clockwise about a quarter turn. If no light passes through the front lens, the

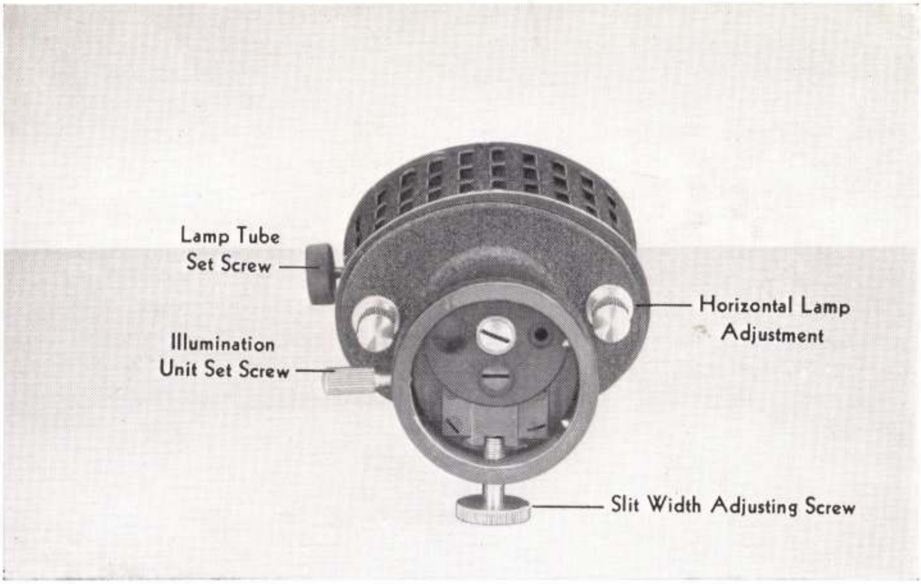

Figure 5

The Illuminating Unit, bottom view.

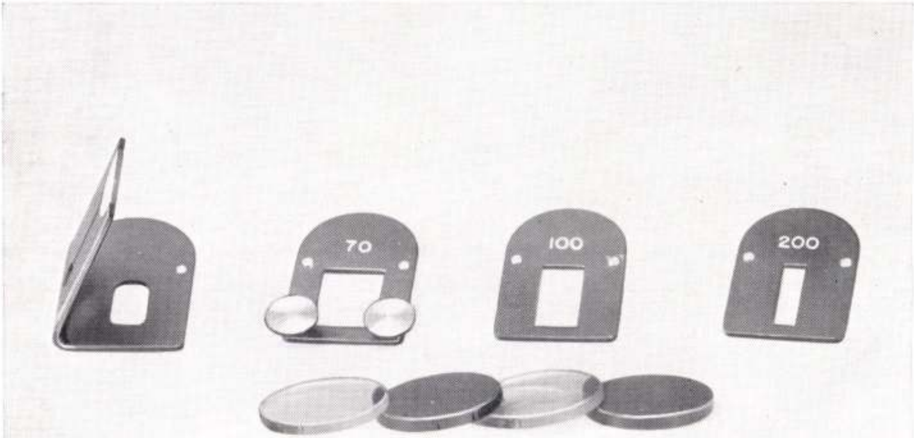

Figure 6

Diaphragms and Filters furnished with the Bausch & Lomb Poser Slit Lamp.

slit is probably closed. Open the slit by means of the SLIT WIDTH ADJUSTING SCREW (Fig. 5).

2. Loosen LAMP TUBE SET SCREW and push the LAMP TUBE downward as far as it will go.
3. Loosen HORIZONTAL LAMP ADJUSTMENT SCREWS.
4. Place a piece of reasonably thin paper against the end of the ILLUMINATION TUBE.
5. There will be a very blurred image of the filament on the paper. Center this image and align it vertically by moving the LAMP-HOUSING horizontally. Tighten the HORIZONTAL LAMP ADJUSTMENT SCREWS.
6. Raise the LAMP TUBE until the front lens of the ILLUMINATION TUBE is filled with light. Tighten LAMP TUBE SET SCREW.

It may be that when adjustment No. 6 is made two shadows will appear instead of the lens being evenly illuminated. In this case raise or lower the lamp until the shadows are symmetrical and the same size.

CHAPTER V

Accessories for the Slit Lamp

The accessories for the Slit Lamp consist of the following:

- 1—No. 70 diaphragm and filter holder
- 1—No. 100 diaphragm
- 1—No. 200 diaphragm
- 1—Red-free filter
- 1—Red filter
- 1—Amber filter
- 1—Blue filter
- 1—Koeppe Mirror

The diaphragms are furnished so that the depth over which the slit is apparently in focus can be changed as desired. The pins in the diaphragm plates fit the holes in the objective lens mount at the front of the ILLUMINATION TUBE. With the full aperture of the lens or when using the No. 70 diaphragm, the divergence of the rays is so great that the depth in which the slit is in focus is very small.

By using the No. 100 or No. 200 diaphragm, the apparent depth of focus of the slit is much greater so that a considerable depth of the eye can be examined without refocusing the slit. The affect, as far as the depth of focus is concerned, is the same as though lenses of the same millimeter focus as the diaphragm numbers were being used. The Koeppe mirror attaches to the lens mount in the same manner as the diaphragm. The mirror mount pins can be inserted in either the upper or lower set of holes depending on which side the lamp arm is to be used. The purpose of the Koeppe mirror is to reduce the angle between the illumination and observation beams so that deeper portions of the eye can be examined.

There is some demand for colored light in bio-microscopy. There is not enough imformation available on slit lamp microscopy with selective filters to make positive statements as to the use of such filters. The filters supplied are the ones most commonly cited in the literature and it is recommended that the user of the Poser Slit Lamp refer to the various papers on the subject. The filters are held by the cone-shaped gibs on the No. 70 diaphragm.

CHAPTER VI

General Description of the Instrument

Fundamentally, a slit lamp consists of an illuminating unit and a binocular magnifier or microscope. These two units are designed mechanically to permit easy and delicate manipulation of either one independent of the other, so that the anterior segment of a living eye can be examined with the utmost ease.

For discussion of the use of the slit lamp, the instrument has been divided into four parts. First, the base; second, the head and chin rest; third, the microscope; fourth, the slit lamp or illumination system.

Before the slit lamp is used, the following description should be studied carefully so that the various parts and adjustments can be readily recognized. Except where otherwise noted the parts referred to are shown in Fig. 3.

The Base

The base contains the transformer and the SWITCH AND INTENSITY CONTROL. The last two parts are in one unit similar to those used on radio controls. The first movement of the knob turns on the lamp at its rated voltage. Continued rotation increases the intensity of illumination but running the lamp at a high voltage will materially shorten the life of the filament.

The base also carries the lamp and microscope support on the metal sled and its braking mechanism. The BRAKE LEVER is operated by the buttons at either end of the sled. Slight pressure on either of the buttons will release the brake and the entire upper mechanism can be moved laterally so as to be positioned before either eye. This lateral movement is sufficiently easy that, if the operator desires, the eye can be observed through the microscope as the entire unit is moved. When the pressure is removed from the buttons the brake action stops any further lateral movement.

Head and Chin Rest

The head and chin rest has two adjustments. The chin rest can be raised and lowered by means of the CHIN REST ADJUSTER in order that the head rest will conform to the length of the face of various patients. Tilting the head rest is accomplished by means of the HEAD REST TILT ADJUSTER. If, for some reason, the patient's head will not fit in the head rest or cannot be placed against the head rest bar, the forehead rest can be removed by loosening the HEAD REST SET SCREWS.

The Microscope

The microscope is a binocular microscope of fairly high power using wide field optics. Various magnifications are possible but it should be realized that, as the magnification is increased, the size and brightness of the field is decreased. For this reason it is advisable to utilize a magnification which has the greatest utility. Where it is desired to use two different magnifications, it is always best to locate the object to be studied with low power and then to change to a high magnification.

The Poser Slit Lamp is provided with a revolving nosepiece that carries two paired objectives. One pair, the 55mm, is provided with the 71-61-38-01 equipment. Another pair of 40mm E.F. can also be mounted on the nosepiece. By using the 55mm objective first, the operator can locate the particular defect that is to be studied, and by pivoting the nosepiece around the center screw, the higher powered objectives are placed in position. These two objectives are approximately parfocal, and it will be necessary to make only a slight adjustment of focus.

MAGNIFICATIONS AND REAL FIELDS FOR THE 71-61-38 MICROSCOPE

Paired Objectives		Paired Wide Field Eyepieces		
Catalog No. and E.F. in MM		Cat. No. 31-15-54 10×	Cat. No. 71-15-58 15×	Cat. No. 71-15-60 20×
71-61-46 55.0mm	Magnification	15.5×	22.5×	31.0×
	Width of Field	12.0mm	10.0mm	7.9mm
71-61-50 40.0mm	Magnification	31.0×	47.0×	62.0×
	Width of Field	5.5mm	4.4mm	3.6mm

After considering and using the various available magnifications, it has been found that a magnification of approximately 15× gives the most satisfactory result in the greatest number of cases.

The experience of various users of slit lamps has shown that the usability of various magnifications is as follows:

(a) 15.5× magnification: This is obtained by the 10× wide angle eyepiece and a 55mm objective. With this magnification a 12mm field is obtained which enables the observer to make a rapid survey of all of the parts of the eye accessible in slit lamp microscopy. This magnification is sufficient for such discriminating examination as that for turbidity of the aqueous. It is sufficient also for the endothelium with specular reflex, although the mosaic structure of the individual cells cannot be observed with this magnification.

(b) 22.5× magnification: This magnification can be obtained by using the same objectives (55mm) but with 15× wide field eyepieces. With this magnification, however, the width of the field is reduced from 12 to 10mm. Using this magnification, it is possible to observe the red blood cells in the loops at the limbus and corneal vessels are easily seen under retro-illumination. The mosaic structure of the endothelium is difficult to distinguish but is just becoming visible.

(c) 31.0× magnification: This magnification is obtained with the 40mm objectives and the 10× eyepieces. The width of field, however, is reduced to 5.5mm. At this magnification it is possible to see the red blood cells more vividly than it was with the 22.5× and the mosaic

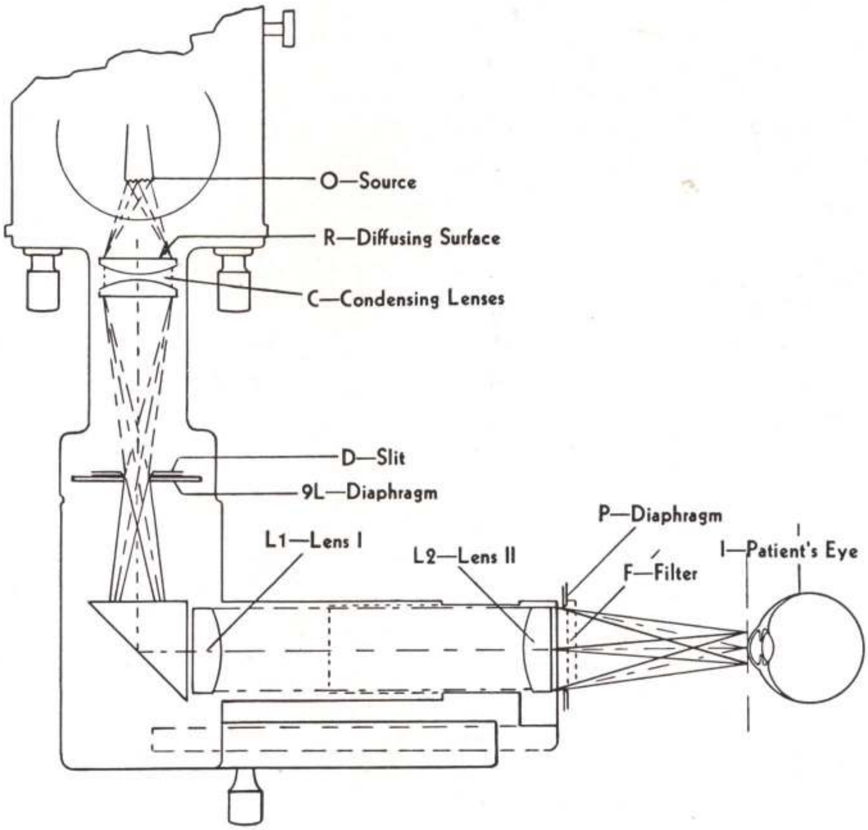

Figure 7

Diagram of Optics and Illuminating System.

structure of the endothelium is visible. With a diameter pupil of approximately 6mm in width, the various layers of the crystalline lens can be examined quite easily.

(d) 47.0× magnification: This magnification is obtained with the 15× eyepieces and the 40mm objectives. The width of the field is reduced to 4.4mm. With this magnification the mosaic structure of the endothelium can be seen quite clearly. At this high magnification it becomes much more difficult to make the examination and requires considerable patience on the part of both the patient and the examiner.

(e) Higher Magnifications: It is possible to obtain higher power objectives for the microscope, but we would recommend careful consideration in the selection of these powers.

The Illumination System

Much of the success of slit lamp microscopy depends upon having the proper type of illumination. The illuminated area should be free from all shadows except those that are caused by obstructions in the eye under examination. To insure that the illuminating system itself is not at fault, it is necessary that the unit be in proper adjustment. Fig. 7 shows a schematic diagram of the optical system used in the illuminating unit. The SOURCE is a 6 volt 4.5 ampere lamp having a straight heavy filament. This filament is imaged by the CONDENSER LENSES on a SLIT. A DIFFUSING SURFACE is used to break up the filament structure in the image. The SLIT can be varied in width from 8.5mm width to the thinnest usable beam, by means of the SLIT WIDTH ADJUSTING SCREW in Fig. 5. The length of the slit is varied by a circular plate, the SLIT LENGTH ADJUSTMENT, carrying apertures of the following sizes:

8.5mm
7.0mm
3.5mm
1.0mm

By rotating the proper aperture before the slit, the length of the slit can be varied. These adjustments thus give the slit beams and also two circular beams. The light passing through the slit is collimated by a lens, L1, and an image of the slit formed by the lens, L2. In order that the illumination of the slit image may be uniform over the entire area of the image, it is important to have the lamp correctly adjusted as described under LAMP ADJUSTMENT.

The entire illuminating unit is raised or lowered by means of the HEIGHT ADJUSTER RING. The SLIT FOCUSING KNOB images the slit on the desired part of the eye. Loosening the ROTATION LOCK SCREW allows the illuminating unit to rotate about its vertical axis.

Two white lines have been engraved on each side of the vertical support. When the lamp is set so that the two lines are in alignment, the optical axis of the illuminating system is directed toward the common vertical axis of the lamp and microscope arms. Another white index mark is engraved on the barrel of the illuminating lens tube. When this mark is set even with the end of the outside tube, the slit image is formed directly in the vertical axis of rotation of the common axis. If the head of the patient is moved so that the slit image is formed on the object to be examined, with the lamp adjusted as just described, the slit image will rotate about that object when the illumination arm is rotated. If the slit and microscope arm are locked together, by tightening the CENTRAL ROTATION LOCK SCREW, the object under observation can be observed from all angles as the arms move as a unit.

Care of the Slit Lamp

While there is very little to get out of order on the Poser Slit Lamp, a reasonable amount of care must be taken in order that the instrument will continue to function perfectly. The following precautions should be observed:

1. Keep instrument covered except when in use so as to protect it from dust.
2. Do not use any oil on any parts.
3. Keep the guide rod and steel track of the sled free from grease and dirt by cleaning with a dry cloth.
4. Leave the microscope in a vertical position at all times.
5. The slit can be cleaned by loosening the ILLUMINATING UNIT SET SCREW and removing the illuminating unit, and cleaning with small cotton swab soaked in alcohol.

Extra and Replacement Parts

The only part that will need replacing will be the lamp. This is a 25 watt 6.0 volt 4.35 ampere projection bulb and can be ordered from Bausch & Lomb under catalog No. 42-42-43.

The extra objectives listed in the magnification table on page 14 are ordered under the catalog number given in the table.

CHAPTER VII

Methods of Illumination

A thorough knowledge of the methods of examination with the slit lamp is necessary to obtain all the help that the instrument can offer. A good technique is as indispensable in bio-microscopy as it is in the ophthalmoscopic examination. While the examination may appear somewhat difficult at first, a little concentrated practice and a knowledge of the fundamentals of the slit lamp soon enable any operator to become skillful in its manipulation.

Essentially the slit lamp cuts an optical section of the eye that can be examined with the microscope. In ordinary microscopy, a specimen must be prepared, sectioned, stained and mounted before the microscope can be used. The slit lamp takes the place of the microtome and makes sections of the eye so that living tissue can be examined.

As the beam of light passes through the various layers of the eye, it will be seen that there are apparent zones of discontinuity. When the light strikes a surface separating two media of different index of refraction, there will be a certain portion of the light reflected. Where the light passes through media that are optically homogeneous, there will be no light reflected, and apparently there will be no light passing through the media. Where the light passes through media that are not optically homogeneous, and that have small particles suspended in them, some of the light will be scattered and the particles will become visible.

It is essential in bio-microscopy as it is in ordinary microscopy to illuminate the object properly in order that the best examination can be made. Similarily there are numerous ways in which the object can be illuminated, depending on the nature of the object and its position in relation to the rest of the field.

With the slit lamp there are six methods of illumination that can be used:

1. Diffuse Illumination.
2. Direct or Focal Illumination.
3. Trans- or Retro-Illumination.
4. Specular Reflection.
5. Indirect Illumination.
6. Sclerotic Scatter.

In some cases only one type of illumination is required, in others several methods may be used. The various types of illumination that have been enumerated and their uses can be briefly summarized as follows:

1. Diffuse Illumination: This is the type of illumination obtained when the eye is illuminated by general illumination. It is obtained with the slit lamp by focusing the slit on some other portion than that under examination. It is particularly valuable, as the first step in the examination, to locate various parts in general, and becomes particularly valuable in locating faint opacities.

2. Focal Illumination: This is the type of illumination obtained when the image of the illuminated slit is focused on the particular area under examination. It is with this type of illumination that it is possible to illuminate the thin sections as already described. It is most frequently employed in the study of cornea, aqueous, lens, and vitreous. With this type of illumination individual structures become visible against a dark background.

3. Retro-Illumination: This is also spoken of as transillumination, and is utilized by examining a transparent structure against an illuminated background; that is, with the microscope focused in the translucent structure of the cornea, and the illumination focused on the background of the iris. This type of illumination is employed in the examination of the cornea for faint deposits on Descement's membrane, as well as for iris atrophy near the pupillary margin.

4. Specular Reflex: This method of illumination is the result of a light that is directly reflected from surfaces such as from the cornea and lens. It is somewhat difficult to use, and it is only possible to utilize this light on one side of the microscope. The microscope is focused on the area from which the light is being reflected, so that the light that is directly reflected passes into the microscope. It is this specular reflection that enables an observer to see the images formed by a cornea of outside objects.

5. Indirect Illumination: This type of illumination is used probably more often than is realized. By indirect illumination particles not in the direct beam of the light are illuminated and can be seen through the microscope. Indirect illumination is used quite often in studying iris pathology and the fine structure of the conjunctiva, by focusing the slit on a portion not under examination in such a way that the scattered light illuminates the area it is desired to study.

6. Sclerotic Scatter: Where the

light is thrown into the eye directly from the side so that the beam is practically parallel to the iris and entering the cornea at the limbus, some of the light will be internally reflected in the substance of the cornea, and objects in the layer can be seen by the light that comes through the cornea to the microscope. This type of illumination is known as sclerotic scatter and is used more or less infrequently.

CHAPTER VIII

Location of Depth

As has already been stated, one of the values of the slit lamp is the possibility of determining at what depth and in what layer of the eye some object or change is located. To make this determination there are four methods that can be used:

1. Focusing the Microscope: This method is used unconsciously at all times. It consists of focusing the slit image and the microscope on the object under examination and then on some known feature of the eye, such as the capsule of the lens; the necessary change in the focus of the microscope allows a judgment to be made of the approximate depth of the object.

2. Optical Section: This is the name given to the lateral view of the light beam as it passes through the eye. In this section of the beam the depth of the lesion can be judged. While the width of the slit that forms the section does not change the section, it will be noticed that a narrow slit makes judgment of the depth somewhat easier. This method of localizing depth is particularly applicable to the cornea and lens.

3. Zones of Specular Reflection: An opacity situation in front of a reflecting surface, such as the lens capsule, will cause a shadow by obstructing some of the light passing back to the microscope.

4. Length of Shadows: This method sometimes furnishes an idea of the depth of a body in the eye. Obviously the size of the shadow cast by the body on some portion of the eye behind it will depend on the distance between them.

CHAPTER IX

General Technique of the Examination

The science of bio-microscopy is too large to be covered in a booklet of this kind. The beginner in the art is urged to study the books and papers on the subject and if possible to attend one of the numerous courses given at various times. In this booklet the subject can be touched only briefly and general recommendations made that have been found helpful in slit lamp microscopy.

A slit lamp examination does not need to be carried out in a totally dark room. In fact it is better if there is sufficient light in the room so that the examiner can see his way around. One of the inherent difficulties of the examination is for the patient to hold fixation, so there should be enough light in the room for him to see objects on which he can fixate.

If the slit lamp is to be mounted on a table, stool or chairs that are adjustable in height should be provided for both the examiner and the patient. If the slit lamp is mounted on an ophthalmic stand, a stool will be required for the examiner.

After the slit lamp is located, the microscope should be placed at its mid position by the HEIGHT ADJUSTER and then the table or stand and examiner's stool adjusted so that the eyepieces of the microscope are at the right level for the examiner. It must be remembered that the examination must proceed fairly rapidly at times, so the examiner can help himself considerably by having the instrument in a position that makes it easier for him to make the necessary adjustments. The eyepieces must be adjusted for the examiner's interpupillary distance.

When the patient is seated before the slit lamp, his chair or stool should be adjusted until the patient's eye is approximately at the proper level. The chin rest is then adjusted for height and the head rest positioned against the forehead. The patient must be instructed to keep his head firmly against the head rest at all times.

If the slit lamp is mounted on a table, the patient should be allowed to rest his arms on the table. If an ophthalmic stand is holding the instrument, the patient can rest his hands on the lamp base or the head rest or chin rest support.

Regardless of whether the user is a skilled bio-microscopist or not, it is advisable to manipulate a new instrument carefully until the use of its controls becomes automatic.

In the beginning, the microscope is set in a central position pointing forward with the lamp arm on the temporal side of the eye to be examined. The patient is instructed to look over the center of the microscope toward the examiner's forehead. From this position the patient can be instructed to look right, left, up, or down.

When the lamp is first turned on, the illuminating lens should be adjusted so as to illuminate the eye with diffuse illumination. The microscope can then be focused on various parts of the eye, rotated about its axis, raised and lowered so that the operator can get the feel of the various adjustments.

From diffuse illumination the cornea and lens can be examined with focal illumination. Various slit widths and lengths should be tried to see the effects that result from these adjustments. Particular attention should be given to the cross section of the cornea and lens that results from focal illumination.

After experimenting with focal illumination, other types of illumination previously described should be tried until the operator can use any method or combination of methods of illumination.

CHAPTER X

The Examination

The Conjunctiva

The examination of the conjunctiva offers no difficulty since it is easily accessible. Either diffuse or focal illumination can be used. Generally it is best to start with diffuse illumination for a rapid survey of the conjunctiva and then use focal illumination when any particular object or area is to be examined in detail. Under reasonably high magnification and with proper illumination the flow of the red corpuscles can be seen in small vessels close to the surface.

The Cornea

All methods of illumination can be used for the cornea. Diffuse illumination serves for a general survey. The reflex from the cornea is extremely bright, but can be easily avoided unless it is desired to use specular reflex for observing the endothelium. The lamp can be rotated so that the light from the reflex image misses the microscope, or the position of the microscope varied so as to throw the reflex image out of the field.

An examination of the layers of the cornea is made by focusing the slit image sharply on the cornea and observing the optical section by angling the microscope.

The cornea can be examined with transillumination by focusing the light on the iris or capsule and observing the cornea by the reflected light. In making an examination in this manner it must be remembered that the color of the observed object will be different than when it was illuminated directly. The color will depend on the color of the iris or reflecting body.

Transillumination shows the remains of vessels of the cornea very clearly. Transmitted light shows bedewing of the epithelial and endothelial layers. Other changes are shown more readily by specular reflection.

Examination by specular reflex has its greatest use in the examinations of the cornea. By proper manipulation the endothelial cells can be seen by specular reflex from the posterior layer of the cornea. The reflex from this layer can be recognized by its characteristic yellow color. The reflex will fill only one objective of the microscope so that binocular observation is not possible.

In examining the cornea for pathological changes, we would recommend:

1. Diffuse illumination for faint changes.
2. Focal illumination for location of depth.
3. Transillumination for areas and vessels, once the depth is obtained with focal illumination.

Thickening and thinning of the cornea are best observed with slit illumination.

Dystrophy and faint opacities may be seen first with diffused illumination and then with focal illumination.

Corneal vessels are more easily identified with retro-illumination, while shrunken and obliterated vessels are seen best with focal illumination.

Blebs can be distinguished with focal and retro-illumination. Deposits on the posterior cornea are seen first with diffused illumination, next with focal illumination, and finally with retro-illumination.

The Aqueous

The examination of the aqueous is best accomplished by means of a thin slit of high illumination and with dilated pupil. Examination with the microscope is across the beam of light against the dark background of the pupil. In other words, the illumination is projected across the aqueous at an angle such that it enters the lens near the margin of the pupil, and the microscope is focused across this aqueous beam.

Faint particles are best seen by lowering the beam of light and focusing the microscope along the top edge of the beam. The examiner's eye thus has an opportunity of adapting itself against a darker background. The patient should fix steadily; the beam of light should be narrow and fairly bright. The examiner first focuses the microscope either on the posterior cornea or on the anterior capsule of the lens. He then focuses the microscope into the aqueous and sits quietly to adapt his eye to the darkened conditions. Faint floating opacities show up very readily.

Congenital anomalies, such as remnants of the pupillary membrane and non-pathological pigmentary deposits on the anterior capsule, are seen in a considerable number of eyes that are otherwise normal.

The Iris

This structure is examined, first under diffused illumination and second under focal illumination. In cases of iris atrophy, transparent areas will be seen, if the illumination is projected through the crystalline lens back of such atrophic areas. In conditions where the iris is lightly pigmented and partly transparent, the examiner unconsciously utilizes the phenomenon of indirect illumination through scattered light in the stroma.

Remnants of the pupillary membrane appear to rise usually from the collarette of the iris and are seen in an appreciable number of normal cases.

The pigment border is best seen with the illumination slightly diffused; a careful examination of the pigment border is recommended, since it seems to indicate early pathology through a somewhat swollen gumminess before deposits are found on the anterior capsule. When it shows this gumminess in cases of suspected beginning pathology, the examination of the pigment border should be followed by an examination of the aqueous for cells. Detailed examination of particular areas of the pigment border are made with focal illumination.

The Crystalline Lens

This is examined with diffuse and focal illumination and with specular reflex. We would add that critical examination is facilitated by utilizing the various available lengths of the slit. With a widely dilated pupil the 7mm slit is excellent. With smaller pupils, smaller slits should be used. This is recommended, as it avoids a scattering of the light if the illumination strikes the iris.

(a) THE ANTERIOR CAPSULE. This is examined nicely by:

1. Diffused illumination;
2. Specular reflex;
3. Focal (slit) illumination.

Diffused illumination is more satisfactory for the preliminary examination. Specular reflex from the anterior capsule is obtained immediately by having the patient look midway between the beam of light and the microscope; the angle between the axis of microscope and the axis of illumination for examination with specular reflex should be in the neighborhood of 45 to 60 degrees.

Slit illumination is particularly desirable for fine deposits on the capsule and for small blebs beneath the capsule. These blebs can be seen both in the beam and through retro-illumination against the background of the beam as it traverses the lens.

(b) LENS SUBSTANCE. The various zones of discontinuity are best seen through a narrow beam of high illumination. In the normal lens the posterior "λ" is more easily seen than the anterior "Y"; the "Y's" are best picked up by a slight swinging of the illumination. The location of the "Y's" is valuable in determining the the depth of opacities.

(c) THE ZONES OF DISCONTINUITY. The most conspicuous of these zones of discontinuity are:

1. The anterior band of the adult nucleus.
2. The anterior central band of the foetal nucleus (anterior "Y").
3. The posterior central band of the foetal nucleus (posterior "λ").
4. The posterior band of the the adult nucleus.
5. The posterior band of the lens (capsule).

(d) THE POSTERIOR CAPSULE: This is best examined with:

1. Focal (slit) illumination;
2. Specular reflex.

The posterior capsule is easily recognized by the deep concave curvature of the slit image as it strikes the capsule. The posterior capsule is recognized by the golden reflex that frequently comes into view from this concave surface.

Remnants of the Hyaloid Artery are picked up in practically every eye and will be found almost in the direct line from the center of the pupil to the optic disc.

The Vitreous

As shown earlier, the slit lamp permits examination of the vitreous to a depth of approximately 5mm back of the posterior capsule. The Poser Slit Lamp is constructed with a view toward getting into the vitreous as deeply as possible. Examination of the vitreous is best made with a thin slit highly illuminated. The retrolental space shows up readily under these conditions.

The appearance of the vitreous structure under the slit lamp is that of delicate, filmy, veil-like bands. This veil-like structure will be seen to surge as the patient's eye is moved.

The senile modifications of the vitreous tend to take on a cobweb-like structure. In the pathological vitreous and veil-like structures are frequently supplanted by fibriles with a scattering of pigment. The liquid vitreous will be seen as literally a shower of particles as the eye is moved.

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