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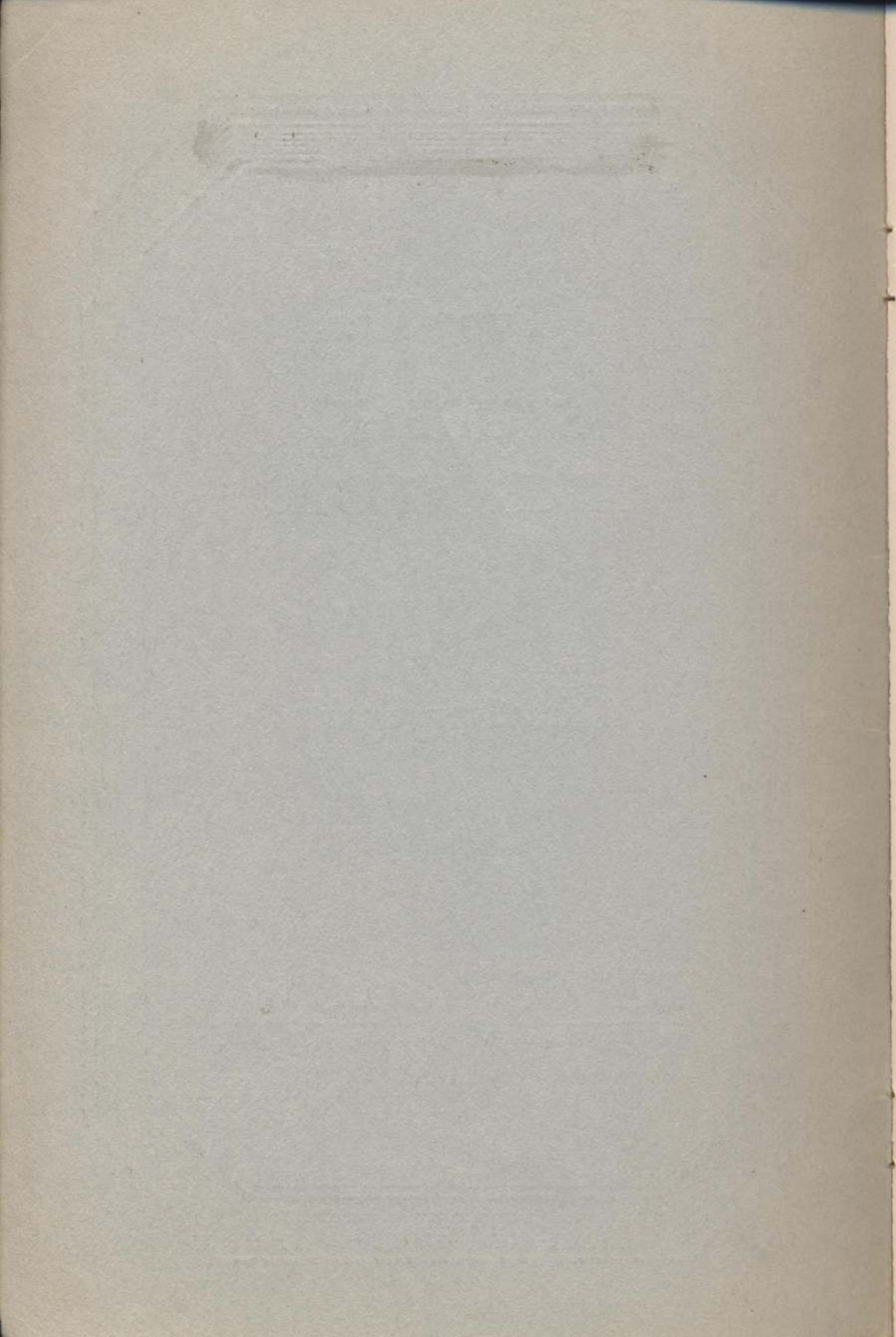
*Directions for Use*

BAUSCH & LOMB

OPTICAL COMPANY



ROCHESTER 2, N. Y.



FL 2

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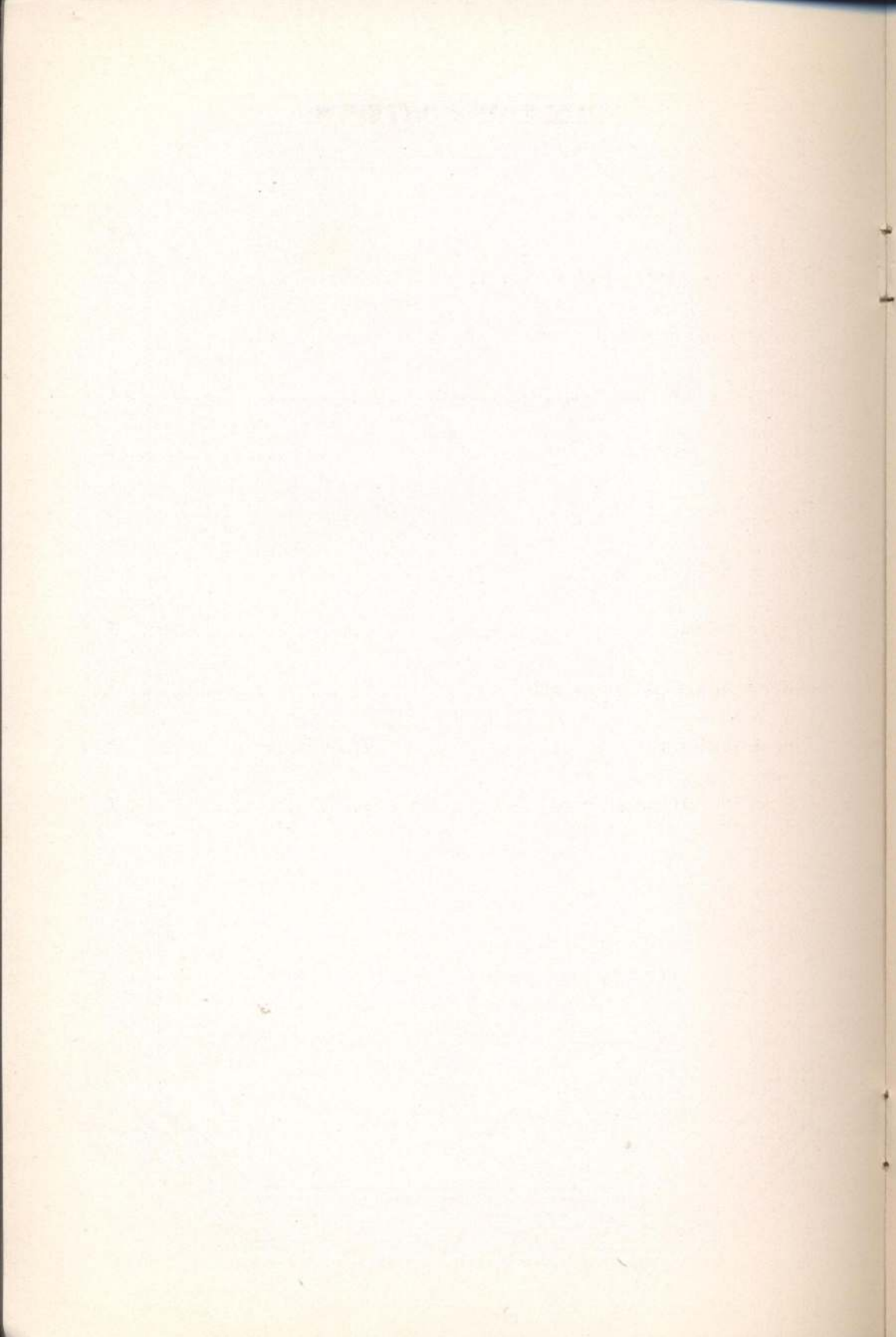
**BAUSCH & LOMB**

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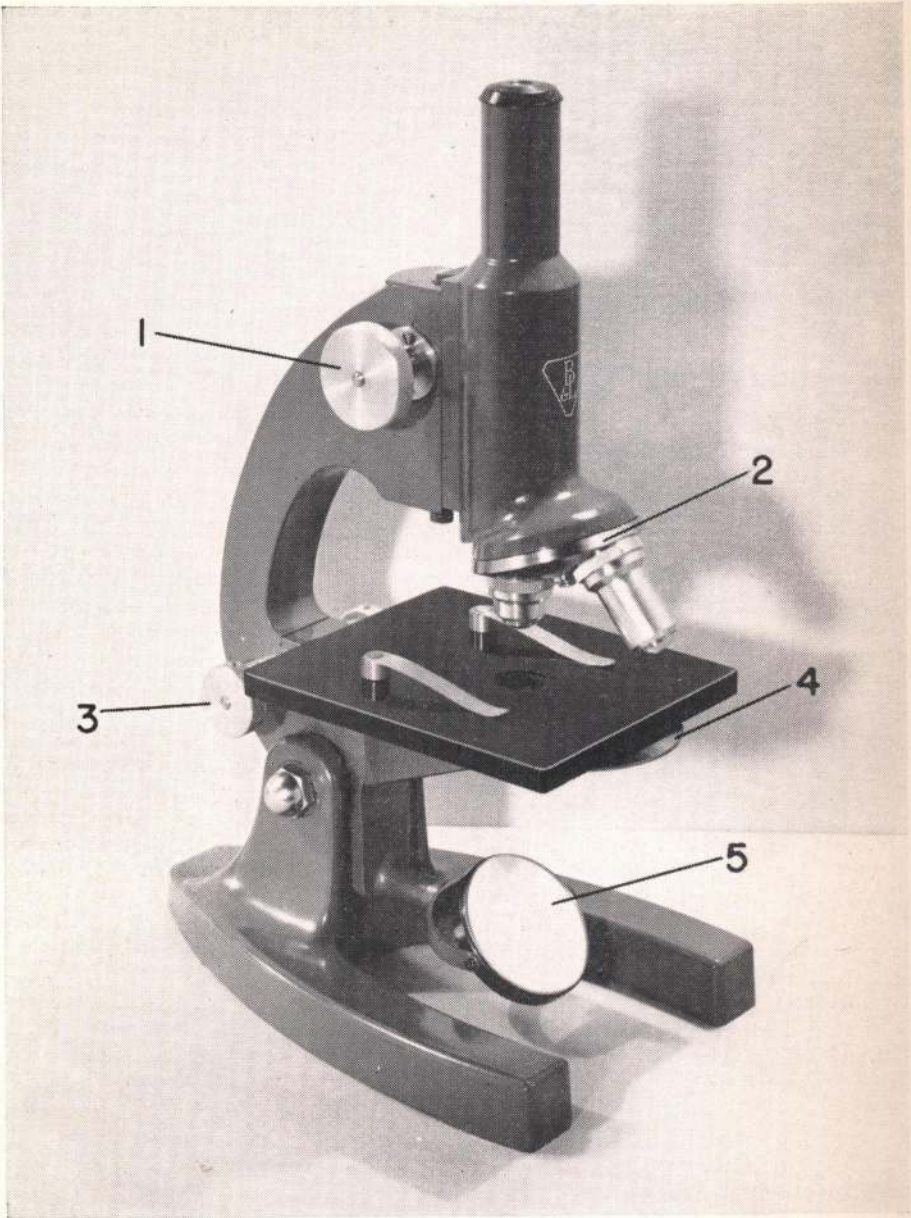
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## TABLE OF CONTENTS

	Page
To Illuminate the Object.....	5
To Focus and Find an Object.....	5
To Focus a Low Power Objective.....	6
The Use of the Revolving Nosepiece.....	6
Cover Glass.....	6
Care of the Microscope.....	7
Care of the Stand.....	7
Care of the Coarse Adjustment.....	7
Fine Adjustment.....	7
Care of Objectives and Eyepiece.....	8



*The Bausch & Lomb Student Microscope*

1—Coarse Adjustment Focusing Knob  
2—Revolving Nosepiece  
3—Fine Adjustment Focusing Knob

4—Substage Diaphragm Disc  
5—Concave Mirror



# The Bausch & Lomb

## STUDENT MICROSCOPE

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### *Directions for Use*

The Bausch & Lomb Student Microscope has been designed to meet the need of a precision built microscope for use in elementary and college science courses. It embodies practically all of the features found on the more expensive laboratory microscopes—coarse and fine adjustments, double revolving nosepiece with parfocalized objectives, 160mm tube length, Society thread, standard diameter eyepieces, reagent resistant stage, etc.

#### **To Illuminate the Object:**

This is an extremely important detail, and should always be carefully done, as one may easily fail to obtain the best results, or be led to wrong conclusions.

Daylight may be used as a source of illumination, although the constancy and convenience of an electric illuminator is to be preferred. If daylight must be used, place the microscope as near directly in front of a north window as possible. Direct sunlight is intolerably bright and if it falls on the table anywhere near the microscope, the glare is exceedingly uncomfortable and is fatal to good observation.

The microscope is equipped with a concave mirror which focuses the parallel illuminating rays from the light source upon the object under examination. Preliminary adjust-

ment of the illumination can be accomplished more quickly at the outset by observing the object without looking through the microscope, keeping the head for this purpose, at one side of the tube. After an approximate adjustment of the mirror has been made in this way, look through the microscope (after focusing upon the object) and adjust the mirror until the field of view is evenly illuminated.

There are four apertures in the substage diaphragm disc. By rotating the disc and going from a larger to a smaller opening, the contrast and depth of focus may be increased; however, one must realize that definition is lost in so doing.

#### **To Focus and Find an Object:**

To focus a microscope is to adjust the relation between the optical system and the object so that a clear image is obtained. With high power objectives, the distance between the cover glass and the front lens of the objective is so short that unless the operation of focusing is conducted with care and skill, there is danger of damaging the specimen, the objective, or both. In lower power objectives, the danger is less because of the greater working distance (distance from slide to objective). It is wise, therefore, for the beginner in microscopy to practice

the operation of finding an object and focusing with low powers first, and then proceed to the higher powers as his touch becomes more sure and his conception of how an image comes into and goes out of focus develops.

### **To Focus a Low Power Objective:**

Lower the head to the level of the stage to be able to see the front of the objective; lower the tube by the coarse adjustment until the front of the objective is within one-quarter inch of the object; look through the eyepiece and slowly elevate by the coarse adjustment until the image is distinct. Use fine adjustment to obtain the clearest focus.

The upward movement should be slow so that, if the object be faint, it is not missed and the adjustment not run beyond its focal distance; or it is possible that, in the case of a very minute object, it may be out of the field of view, in which case the surface of the cover glass, or the minute particles of dust upon it, should be distinguishable.

The object will first appear with faint outlines and indistinct; then gradually more distinct, and finally sharply defined, and if adjustment goes beyond this point, it will gradually become more dim, in which case return to the point of greatest distinctness.

A low power objective permits the observer to see a much greater area of the specimen than one can see with a high power objective; therefore, it is useful as a "finder." The specimen may be examined with a low power objective and some particular point of interest in the specimen located and moved to the center of the field of view. Then, if greater magnification is desired, the high power objective may be brought into use by means of the revolving nosepiece.

### **The Use of the Revolving Nose-piece:**

This is provided in order to enable rapid, convenient exchange of one objective for another. To effect this change, grasp the objectives between the thumb and forefinger of the right hand and rotate until the desired objective is brought into line with the axis of the body tube. It is very important that exact alignment be obtained. The correct setting is indicated by a slight click which indicates the stop for each objective.

The objectives will be so nearly parfocal that, if the microscope is focused for either of them, it will be possible to swing the other objective into place without touching the coarse adjustment and with only a slight turn of the fine adjustment required to restore perfect focusing.

Should it be desired to focus the high power objective directly, the following procedure is recommended:

Lower the head to the level of the stage and look between the objective and the cover glass. Slowly lower the objective with the coarse adjustment until the front of the objective is nearly in contact with the cover glass; look into the eyepiece; slowly elevate the tube by the coarse adjustment until the image appears. Use fine adjustment to obtain the clearest focus.

It is also advisable, while watching for the image to appear, to move the object slowly in different directions, as the flitting of shadows across the field will give indication that the objective is nearing the focal point.

### **Cover Glass:**

It must not be forgotten that in microscopical work we are dealing with minute things and this applies especially to cover glass.



In preliminary examinations of solid objects with low powers, a cover glass may be dispensed with, but where fluids are used, whether with low or high power, it should always be used. A drop or small quantity of fluid placed upon a slide assumes a spherical form and, on viewing it with a low power, it will be found to give a distorted field and cause disagreeable reflections and shadows. For high power examination the front lenses will be so close to the fluid that capillary attraction will cause an adhesion to the front surface of the objective if the front lens once touches the liquid. By merely dropping a cover glass upon it, these objections are overcome.

The objectives were designed for use with a cover glass 0.18mm in thickness. For satisfactory performance, use a cover glass as close to this thickness as possible.

### **Care of the Microscope:**

Besides acquiring the ability to use an instrument properly with its accessories, it is important to know how to keep it in the best working condition. It may be said without reserve that an instrument properly made at the outset and judiciously used should hardly show any signs of wear, either in appearance or in its working parts, even after the most protracted use.

Especial care should be given to the optical parts; in fact, such care that they will remain in as good condition as when first received, after any amount of use.

### **Care of the Stand:**

Keep free from dust is one of the first rules to be observed. When not in use, place the microscope in a cabinet, or cover with a plastic

cover, bell jar or close-mesh cloth, such as cotton flannel or velvet, which should reach to the table.

When handling the stand, grasp it by the arm and base, in order to achieve a firm support.

Avoid sudden jars, such as placing upon the table with force.

If the inclination joint should become loose so as to prevent the arm from being set at any angle of inclination, it should be tightened by drawing up on the two opposing nuts in opposite directions.

### **Care of the Coarse Adjustment:**

Do not keep hold of the coarse adjustment knobs while operating the fine adjustment, as the former must be free to rotate.

Special care should be given to keep the coarse adjustment free from dust as its effect is particularly pernicious. The slides and rack and pinion are necessarily exposed and the lubricant is apt to catch dust and also to gum. The tube should be occasionally withdrawn from the arm and the slides carefully wiped with a cloth moistened with Xylol. Lubricate by applying a small quantity of paraffine oil to a cloth and wiping well over the surfaces, removing the superfluous amount with a dry cloth. The teeth of neither rack nor pinion should ever be lubricated. An occasional cleaning with a toothbrush is advisable.

It is advisable occasionally to lubricate the pinion shank on both sides of the arm with a very minute quantity of paraffine oil.

### **Fine Adjustment:**

The fine adjustment mechanism is sturdily constructed and should, under normal operation, work satisfactorily throughout the life of the instrument. Should the fine adjustment become damaged or cease to

work satisfactorily, the instrument should be returned to the factory for repair.

The fine adjustment mechanism on this instrument has a relatively short range of motion. Care should be exercised that the operator does not attempt to force it beyond its limits. It would be well, before each focusing operation, to set the fine adjustment at the mid-point of its range of motion. This may be accomplished by setting the fine adjustment operating button so that the screw located on the knurled surface lies on top.

Be sure to release the coarse adjustment buttons while operating the fine adjustment.

#### **Care of Objectives and Eyepieces:**

The user should supply himself with a camel's hair brush and a well washed piece of linen. On account of its fine texture, chamois skin is

desirable, but only after it has been repeatedly washed. No dust should be permitted to settle upon the lenses nor should the finger come into contact with any of the surfaces.

The objectives should be left attached to the microscope, and the eyepiece left in the tube, so that no dust can enter and settle upon the rear lens of the objective.

If dust has settled on the eye-lens of the eyepiece, it will appear as dark, indistinct spots upon the field of view. To remove the dust, brush it off with a camel's hair brush and then wipe with a well washed chamois skin or piece of linen. Use the camel's hair brush again to remove any lint.

The systems should never be separated, even if they can be unscrewed, as they are liable to become decentered and dust may enter.

Avoid all violent contact of the front lens with the cover glass.



