# HumaScope

## | User Manual


CE

Cat.-No. 16100/1

| Revision List of the Manual | | |
|---|---|---|
| No. | DATE / Rev. | REVISION DESCRIPTION |
| 1 | 01/2004-07 | First edition |
| 2 | 02/2006-08 | Addition of Chapter 4.2.1 / Köhler Illumination; Update Specifications |
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## 1 INTRODUCTION

This manual is considered as a part of the instrument; it has to be at the operator's hand as well as at the maintenance operator's availability. For accurate installation, use and maintenance, please read the following instructions carefully. In order to avoid instrument or personal damages, carefully read the "GENERAL SAFETY WARNINGS", describing the suitable operating procedures. In case of breakdowns or any troubles with the instrument, apply to the local Technical Service.

## 2 USER WARRANTY

HUMAN warrants that instruments sold by one of its authorised representatives shall be free of any defect in material or workmanship, provided that this warranty shall apply only to defects which become apparent within one year from the date of delivery of the new instrument to the purchaser.
The HUMAN representative shall replace or repair any defective item at no charge, except for transportation expenses to the point of repair.
This warranty excludes the HUMAN representative from liability to replace any item considered as expendable in the course of normal usage, e.g.: lamps, valves, syringes, glassware, fuses, diskettes, tubing etc.
The HUMAN representative shall be relieved of any liability under this warranty if the product is not used in accordance with the manufacturer's instructions, altered in any way not specified by HUMAN, not regularly maintained, used with equipment not approved by HUMAN or used for purposes for which it was not designed.
HUMAN shall be relieved of any obligation under this warranty, unless a completed installation / warranty registration form is received by HUMAN within 15 days of installation of this product.
This warranty does not apply to damages incurred in shipment of goods. Any damage so incurred shall be reported to the freight carrier for settlement or claim.

## 3 INTENDED USE OF THE INSTRUMENT

The instrument has to be used for the expected purposes and in perfect technical conditions, by qualified personnel, in working conditions and maintenance operations as described in this manual, according to the GENERAL SAFETY WARNINGS. This manual contains instructions for professional qualified operators.

## 4 GENERAL SAFETY WARNINGS

Use only chemical reagents and accessories specified and supplied by HUMAN and/or mentioned in this manual.
Place the product so that it has proper ventilation.
The instrument should be installed on a stationary flat working surface, free from vibrations.
Do not operate in area with excessive dust.
Work at room temperature and humidity according to the specifications listed in this manual.
Do not operate this instrument with covers and panels removed.
Only use the power cord specified for this product, with the grounding conductor of the power cord connected to earth ground.
Use only the fuse type and rating specified by the manufacturer for this instrument, use of fuses with improper ratings may pose electrical and fire hazards.
To avoid fire or shock hazard, observe all ratings and markings on the instrument.
Do not power the instrument in potentially explosive environment or at risk of fire.
Prior to cleaning and/or maintaining the instrument, switch off the instrument and remove the power cord.
For cleaning use only materials specified in this manual, otherwise parts may become damaged.
It is recommended always to wear protective apparel and eye protection while using this instrument.
Respective warning symbols, if appearing in this manual, should be carefully considered.

## 5 DISPOSAL MANAGEMENT CONCEPT

The currently valid local regulations governing disposal must be observed. It is in the responsibility of the user to arrange proper disposal of the individual components.
All parts which may comprise potentially infectious materials have to be disinfected by suitable validated procedures (autoclaving, chemical treatment) prior to disposal. Applicable local regulations for disposal have to be carefully observed.
The instruments and electronic accessories (without batteries, power packs etc.) must be disposed off according to the regulations for the disposal of electronic components.
Batteries, power packs and similar power source have to be dismounted from electric/electronic parts and disposed off in accordance with applicable local regulations.

## 6 INSTRUMENT DISINFECTION

Instruments or parts which may come in contact with biological samples (patient specimens, controls etc.) should be considered at least potentially infectious.
Before doing any servicing on the instrument it is very important to thoroughly disinfect all possibly contaminated parts. Before the instrument is removed from the laboratory for disposal or servicing, it must be decontaminated/disinfected. Decontamination/disinfection should be performed by authorised welltrained personnel, observing all necessary safety precautions. Instruments to be returned have to be accompanied by a disinfection certificate completed by the responsible laboratory manager. If a disinfection certificate is not supplied, the returning laboratory will be responsible for charges resulting from non-acceptance of the instrument by the servicing centre, or from authority´s interventions.

## 7 NOTICE

Every effort has been made to avoid errors in text and diagrams, however, HUMAN GmbH assumes no responsibility for any errors which may appear in this publication. It is the policy of HUMAN GmbH to improve products as new techniques and components become available. HUMAN GmbH therefore has to reserve the right to change specifications if necessary in the course of such improvements.

# Contents

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## 2 APPLICATIONS

The HUMASCOPE biological microscope is suited for use in medical and sanitary establishments, laboratories, institutes, agricultural research networks, colleges and universities for clinical microscope inspections and may be used as an instructional instrument. It can also be used in research work such as biology, bacteriology, cytology, histology and pharmaceutical chemistry.

## 3 SPECIFICATIONS

**Ocular**

| Designation | Magnification | Field Of View Diameter | Focal Length |
|---|---|---|---|
| Wide Field | 10X | 18mm | 24.94mm |
| Plan Field | 16X | 11mm | 15.58mm |

**Objective**

| Designation | Magnification | Numerical Aperture | Working Distance |
|---|---|---|---|
| Achromatic | 4X | 0.10 | 17.912mm |
| | 10X | 0.25 | 2.04mm |
| | 40X | 0.65 | 0.65mm |
| | 100X(Oil) | 1.25 | 0.09mm |

**Total Magnification**

| Objective<br>Total Magnification<br>Ocular | 4X | 10X | 40X | 100X |
|---|---|---|---|---|
| 10X | 40X | 100X | 400X | 1000X |
| 16X | 64X | 160X | 640X | 1600X |

- Abbe-type condenser N.A.=1.25 with an adjustable iris diaphragm
- Coarse focussing range: 30mm with a coarse focussing stopper
- Fine focussing range: 30mm
- Fine focussing division interval: 0.002mm
- Area of the stage: 124 X 153mm
- Specimen shifting range: transversal 70mm, longitudinal 50mm
- 6V20W built-in variable-brightness lamp
- 5-objective revolver
- Köhler illumination

## 4 STRUCTURE

### 4.1 Base

The base supports the entire weight of the microscope. It has four rubber feet to stabilise the instrument.

### 4.2 Illumination System

In order to provide sufficient brightness to observe the specimen and make full use of the resolution of the objectives, this instrument uses a 6V, 20W built-in variable-brightness lamp (see figure 4.0). For optimal results, the condenser must be adjusted properly. The condenser is composed of two parts. The iris diaphragm is mounted under the stage, the illumination source is in the base. Adjust the condenser iris (mounted under the stage) to match the aperture of the objective. The stage can be raised and lowered using the focussing knobs. The light axis of the condenser must coincide with the light axis of the illumination source. To correct the alignment, adjust 3 screws in the part of the condenser mounted on the stage.

#### 4.2.1 Köhler Illumination

The HUMASCOPE is equipped with Köhler illumination. In order to get the best image possible form the optical setup of the microscope for brightfield, phase contrast and differential interference contrast, it is crucial that the light path be set up properly.

HOW TO SET UP HUMASCOPE PROPERLY FOR KÖHLER ILLUMINATION:

If the light path is set up properly, the user has the advantage of an evenly illuminated field, a bright image without glare and minimum heating of the specimen.

The following instructions apply to a microscope equipped for transmitted-light brightfield illumination..

1. Switch on the light source and make sure that light is passing through the field diaphragm at the base of the microscope stand. It may help to place a piece of paper over the field stop to confirm this.
   Place your specimen on the stage and turn the nosepiece (which holds the objective lenses) to the 10X or 20X lens. Open the field diaphragm as far as possible.

2. Check if the specimen is illuminated. It will help to place a piece of paper over the top of the specimen to see if light is getting through. If you are using the brightfield condenser stop, open the iris diaphragm (or aperture diaphragm) on the condenser turret (which contains the stops for brightfield and phase, etc) to the maximum. The front lens should be about 1-3 mm above the specimen. Use the condenser focussing knobs to do this.

3. Bring the specimen into focus with the coarse and fine focussing knobs. If the light is too bright, reduce the light intensity using the light adjustment wheel.

4. When the specimen is in focus, start to close the field diaphragm and also begin to carefully move the condenser up and down with the condenser focussing knobs. Look for a sharp image of the edge of the field diaphragm.

5. When the edge of the field diaphragm silhouette is sharply defined, centre it with the two knurled knobs that extend diagonally from the condenser. Close down the field diaphragm most or all the way to get it centred properly. When it is centred, open the field diaphragm until its edge is outside the field.

6. Your specimen should now be properly illuminated and you should have a good image.

### 4.3 Mechanical Stage (Slide Holder)

The HUMASCOPE features a double-layer stage mechanism. This mechanism allows the operator to move the specimen slide along the X or Y axis by turning the corresponding knob. This is very useful at higher magnifications, as it can be difficult to move the slide in small enough increments by hand. Also, moving the slide by hand can be difficult since it must be moved in the opposite direction of the observed movement. The mechanical stage also has a graduated scale so you can see how far the slide has been moved or keep track of the position of various objects on the slide.

### 4.4 Ocular, Objective and Nosepiece

The microscope imaging system is composed of the two oculars and the objective (see figure 4.0). The objectives are screwed into the threaded holes in the nosepiece, which can be rotated to quickly achieve the desired magnification. The advanced, high-precision nosepiece design ensures that the field of view is always centred in the observation area for precise focussing (parfocal). The ocular tube is inclined 450 for convenient, fatigue-free observation.

### 4.5 Coarse and Fine Focussing Knobs

The HUMASCOPE features coaxial coarse and fine focussing knobs on the left and right side of the instrument. The knobs are located below the stage and are easy to operate (see figure 4.0). The coarse and fine focussing range is 30mm. The fine focussing knobs are the smaller knobs centred in the coarse focussing knobs. The lever on the left, inside the left-side coarse focussing knob, is the coarse focussing stopper. When the specimen is in clear focus, the stopper may be used to lock in the focus. This also allows the stage to be lowered and raised again to exactly the same position. When the position is no longer needed, simply loosen the stopper.

### 4.6 Condenser

The Abbe condenser is a specially designed lens mounted under the stage. It can be raised or lowered. It has an iris-type aperture to control the diameter of the beam of light entering the lens system. By changing the size of the iris and moving the lens toward or away from the stage, the diameter and focal point of the cone of light that goes through the specimen can be controlled. Abbe condensers become most useful at magnifications above 400x. The condenser lens system should have a numerical aperture equal to or greater than the N.A. of the objective lens being used.

### 4.7 Immersion Oil

Immersion oil is a special oil used in microscopy only with the 100X objective lens (usually at 1000X total power). A drop is placed on the cover slip and the objective is lowered until it just touches the drop. Once brought into focus, the oil acts as a bridge between the glass slide and the glass in the lens. This concentrates the light path and increasing the resolution of the image

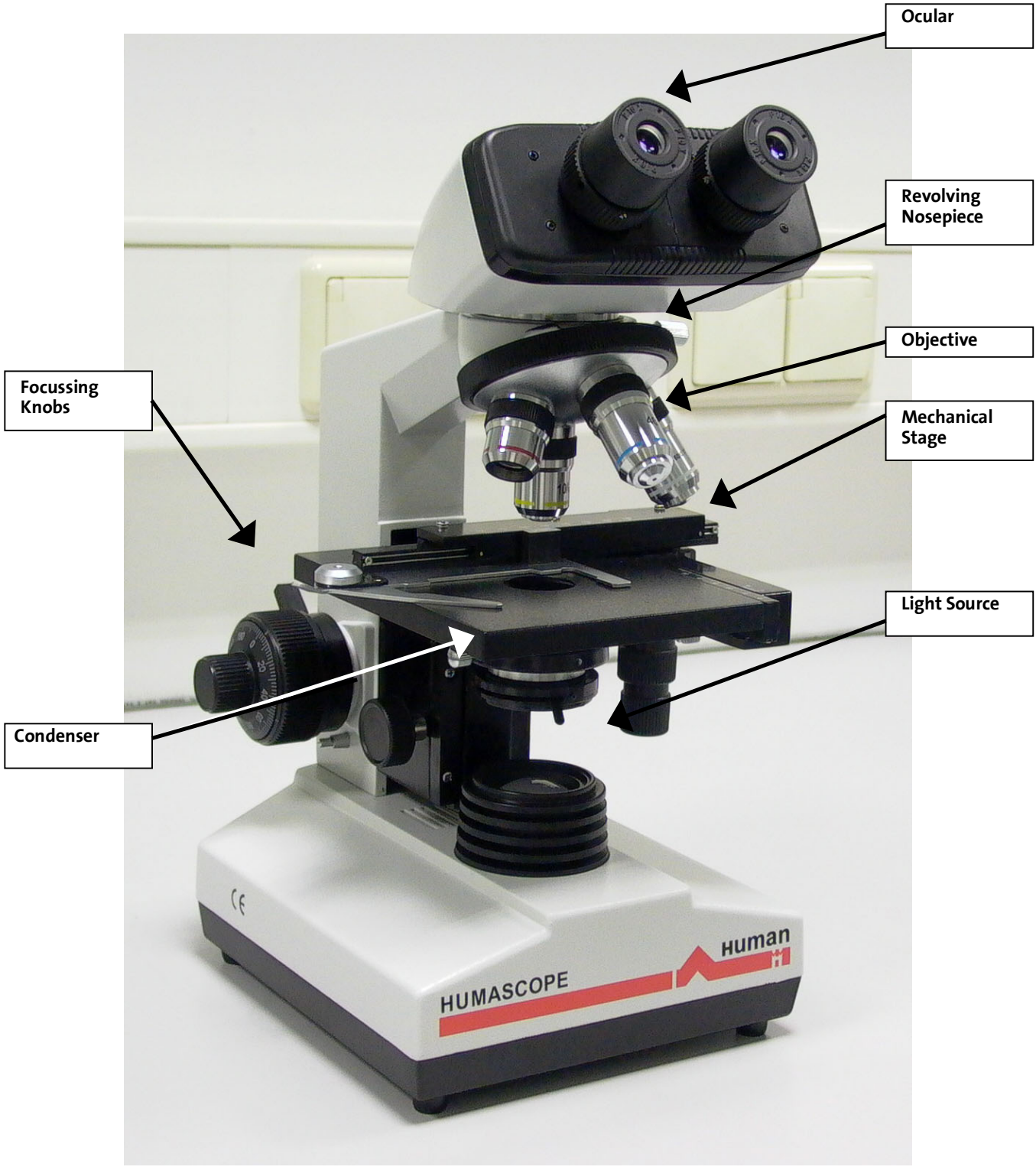



Figure 4.0: HUMASCOPE

## 5 OPERATION

1. Screw the objectives into the threaded holes in the nosepiece in order of their magnification. Insert the oculars into the inclined ocular tube.
2. Place a specimen slide on the stage. Adjust the stage so that the specimen is centred over the hole in the stage.
3. Using first the 10X objective, turn the coarse focussing knob to move the objective close to the specimen. Now observe the image through ocular and turn the coarse focussing knob to lower the objective until the image comes into approximate focus. Next, turn the fine focussing knob until the image is sharp. Thanks to the instrument's precise and reliable nosepiece, a clear focus is maintained even when switching objectives.
4. The specimen can also be observed by replacing the lower condenser with a plan-concave reflecting mirror.

## 6 STANDARD ACCESSORIES

| ITEMS | CONTENTS | QUANTITY |
|---|---|---|
| 1 | Ocular WF10X, P16X | 2PCS each |
| 2 | Objective 4X 10X 40X 100X | 1PC each |
| 3 | Reflecting Mirror | 1 |
| 4 | Spare Lamp | 1 |
| 5 | Spare Fuse | 1 |
| 6 | Immersion Oil | 1BOTTLE |
| 7 | User Manual | 1 |
| 8 | Blue Filter | 1 |
| 9 | Power Cable | 1 |
| 10 | Dust Cover HUMAN | 1 |

## 7 CARE AND MAINTENANCE:

1. As with any other optical instrument, the microscope should be kept in a cool, dry, dust- and acid-free location. The instrument should be covered with dust cover after use.
2. Never disassemble the lenses; these are precisely adjusted and glued in place at the factory. Stains can be removed from the lens by wiping it carefully with a soft, clean cloth moistened with alcohol. Take care, however, that alcohol does not seep it into the objectives to avoid dissolving the glue. Dust on the lens can be removed using a clean lens brush.
3. The coarse and fine focussing assembly and nosepiece are precisely adjusted at the factory and should not be dismantled.
4. When not in use, keep the objectives in the objective box and cover the ocular tube with the ocular-tube cover.

## 8 DISPOSAL MANAGEMENT CONCEPT:

The currently valid local regulations governing disposal must be observed. It is in the responsibility of the user to arrange for proper disposal of the individual components.
All parts which have come into contact with potentially infectious materials must be disinfected using a valid procedure (autoclaving, chemical treatment) prior to disposal. Applicable local regulations for disposal must be carefully observed.
The instrument and electronic accessories (without batteries, power packs etc.) must be disposed of according to regulations for the disposal of electronic components.
Batteries, power packs etc. must be separated from electric/electronic parts and disposed of in accordance with applicable local regulations.

## 9 MICROSCOPE GLOSSARY

### 9.1 Darkfield Microscopy

Darkfield microscopy is a method of acquiring a slide image. It is specific to the way the light is projected onto a slide in the microscope equipped with darkfield condenser. The method allows elements in the field of view to be distinguished that would be invisible or poorly visible using other methods of lighting (such as brightfield or phase contrast light). This method is commonly used to evaluate slides on which the object and the background are the same colour. (Such as red blood cells in vital blood or clear bacterial organisms in saline.) In darkfield microscopy, objects appear in the form of glowing outlines on a black/dark background.

The advantage of darkfield illumination is that details can be seen that are normally not resolved by the microscope's objective. While the actual details cannot be seen, the light reflected by them can. A nice analogy here is that of dust in a room. Normally, in a well-lit room very small dust particles cannot be seen. However, if the lights are turned out, a beam of light from an acute angle makes these same particles visible. Besides the optical advantages, darkfield illumination is very beautiful and gives an almost science-fiction-like image.

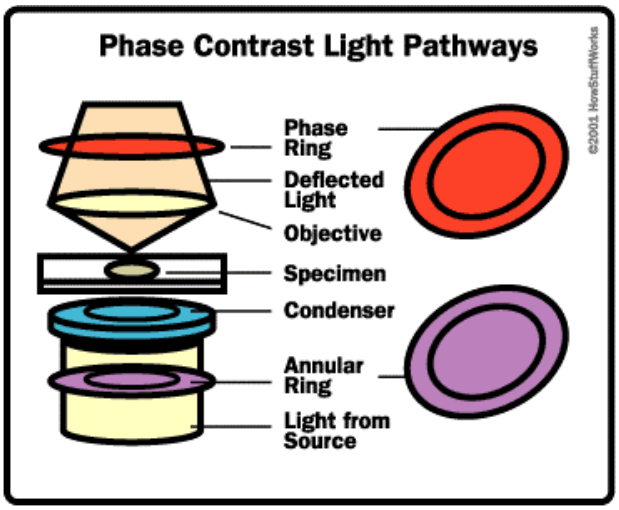
What is the difference between darkfield and brightfield?
The difference between the two is the way light is projected onto the slide. As a result, elements on the slide not visible (or poorly visible) in bright light are visible with darkfield illumination.

### 9.2 Brightfield

This is the basic microscope configuration.
In brightfield microscopy, the transparent or translucent specimen is either naturally coloured or stained and appears dark against a bright, white background or field.

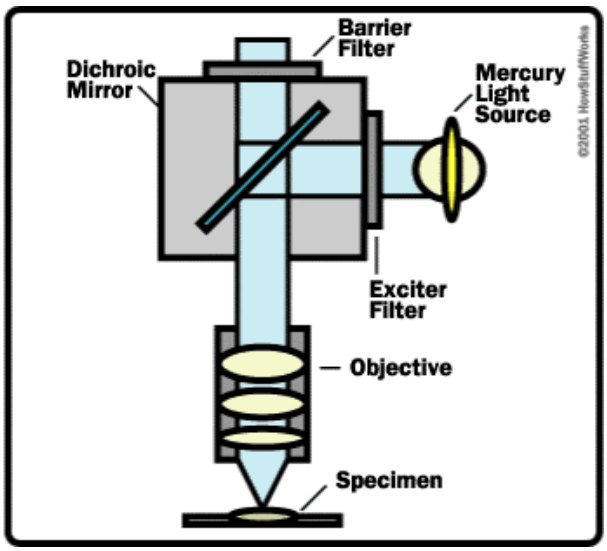
### 9.3 Phase Contrast

Phase contrast is a technique for revealing the structural features of microscopic, transparent objects that cannot otherwise be accomplished with brightfield microscopy. Phase contrast achieves the same effect as staining a specimen (which can kill a live specimen). In phase-contrast microscopy, the "staining" is in the optics.
In a phase-contrast microscope, the annular rings in the objective lens and the condenser split the light. The light that passes through the central part of the light path is recombined with the light that travels around the periphery of the specimen. The interference produced by these two paths produces images in which the dense structures appear darker than the background.



### 9.4 Fluorescence Microscopy

The fluorescence of a substance is seen when a molecule is exposed to a specific wavelength of light (excitation wavelength or spectrum) and the light it emits (the emission wavelength or spectrum) is of a higher wavelength. To view this fluorescence in the microscope, several light-filtering components are needed. Specific filters are needed to isolate the excitation and emission wavelengths of a fluorochrome. A bright light source with proper wavelengths for excitation is also needed. For normal fluorescence applications, this is a mercury vapour arc burner.




### 9.5 Lenses

- **objective lens** - gathers light from the specimen
- **ocular** - transmits and magnifies the image from the objective lens to your eye
- **nosepiece** - rotating mount that holds 4 interchangeable objective lenses
- **tube** - holds the ocular at the proper distance from the objective lens and blocks out stray light

### 9.6 Focus

- position the objective lens at the proper distance from the specimen
- **coarse-focus knob** - used to bring the object into the focal plane of the objective lens
- **fine-focus knob** - used to make fine adjustments to focus the image

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