BIO 201 Lab 1
Experiments 1, 2, 3

Professor Diane Hilker

Overview

I. Exp. 1: Introduction to the Microscope

II. Exp. 2: Survey of Microbes

III. Exp. 3: Collection of Microbes

I. Exp. 1: Intro. to the Microscope

- **Purpose:** To review the use & care of the compound light microscope

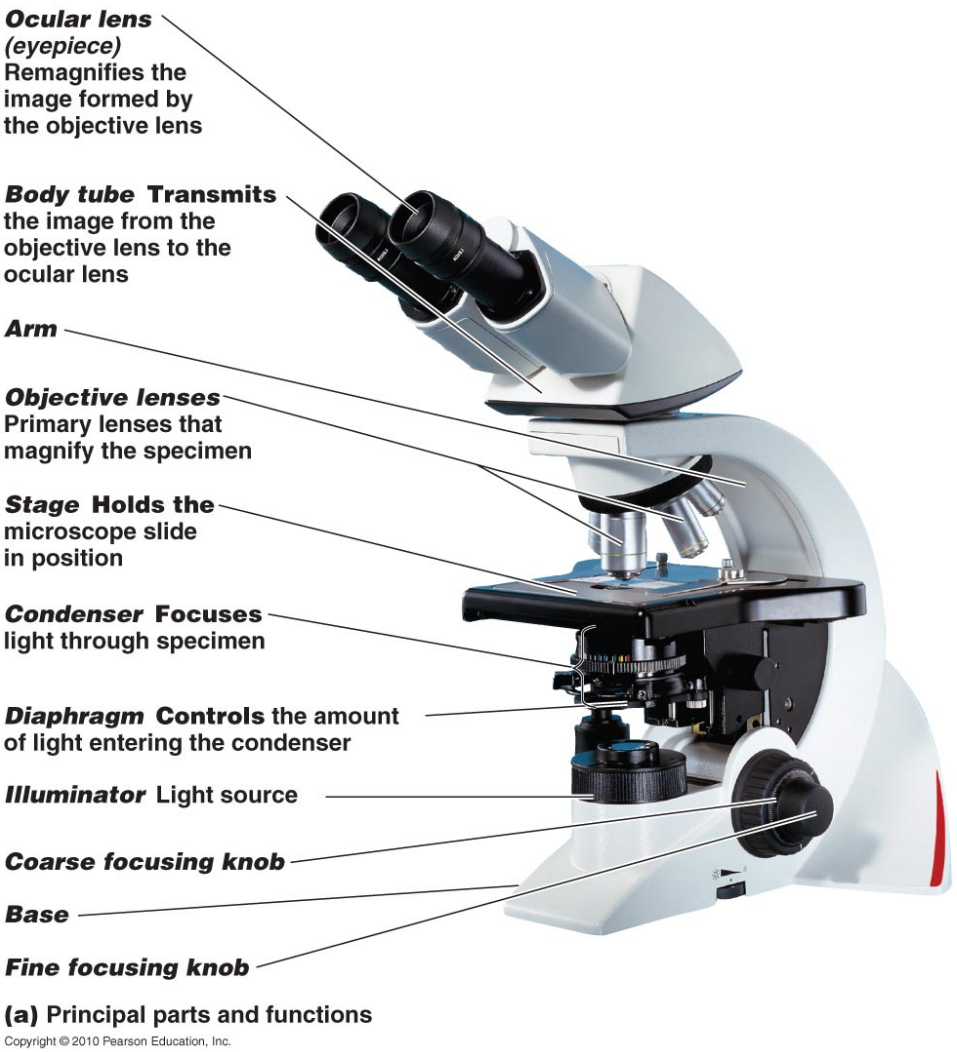


Fig. 3.1 Textbook

I. Exp. 1: Intro. to the Microscope

- Compound Binocular Light Microscope
  - **(2) Sources of Magnification:**
    - Eyepiece or Ocular (10x)
    - Objectives (4):
      - Scanning Power: 4 x
      - Low Power: 10x
      - High Power: 40x
      - Oil Immersion: 100x
- **Parfocal**: ability to go from one objective to another with minimal focusing

I. Exp. 1: Intro. to the Microscope

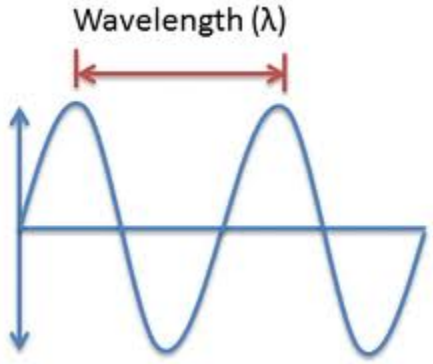
- Total Magnification: TM
  - TM=Magnification of Eyepiece X Magnification of Objective

	Eyepiece Magnification	Objective Magnification	TM
Scanning	10X	4X	40X
Low	10X	10X	100X
High Dry	10X	40X	400X
Oil Immersion	10X	100X	1000X

I. Exp. 1: Intro. to the Microscope

- **Resolution or Resolving Power (RP)**
  - Ability to distinguish detail clearly
  - To be able to tell 2 points as separate points and not one point
  - $RP = \frac{\text{Wavelength of Light}}{2 \times \text{Numerical Aperture}} = \frac{\lambda}{2NA}$

I. Exp. 1: Intro. to the Microscope



- Wavelength of light (nm)
  Red light = 700 nm
  Blue light = 400 nm

- $RP_{red} = \frac{700\ nm}{2(1)} = 350\ nm$
- $RP_{blue} = \frac{400\ nm}{2(1)} = 200\ nm$
- Lower the resolution, better the clarity
- Blue filter provides the best resolution with a halogen light bulb
- Blue filter NOT needed with microscopes that have a LED light bulb

I. Exp. 1: Intro. to the Microscope

- **Numerical Aperture (NA):** describes the cone of light that enters the lens so as to see fine detail. Two things make up NA:
  - **Angular Aperture**: angle of light as it goes through the lenses & filters of the condenser & into the objective (Constant)
  - **Refractive Index:** how light travels through a medium
    - Refractive Index of Air = 1.0
    - Refractive Index of Oil = 1.5

I. Exp. 1: Intro. to the Microscope

- $RP_{air} = \frac{400\ nm}{2(1.0)} = 200\ nm$

- $RP_{oil} = \frac{400\ nm}{2(1.5)} = 133\ nm$

- **Better resolution with oil**

Overview

I. Exp. 1: Introduction to the Microscope

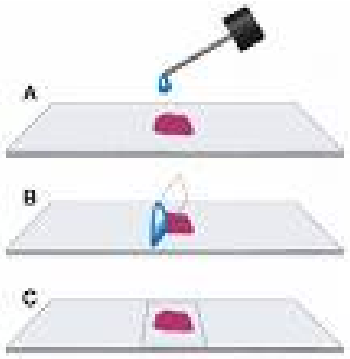
II. Exp. 2: Survey of Microbes

III. Exp. 3: Collection of Microbes

II. Exp. 2: Survey of Microbes

- **Purpose:** To become familiar with using a microscope & to view various microbes

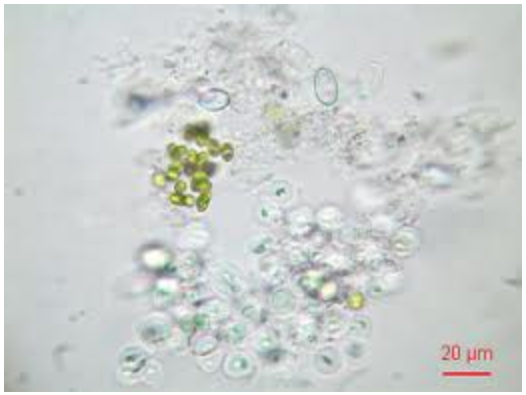
  - **Wet Mount**: observing living cells
    - Focus on edge of coverslip
    - Scanning-dim light using diaphragm
    - Move toward center of slide
    - Observe under Low & High Powers
    - Slides will dry out quickly

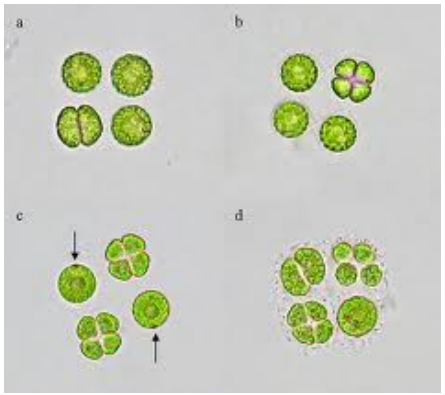


II. Exp. 2: *Survey of Microbes*

- 4 Slides: Largest to smallest microorganisms

1. Pond Water: algae–much variation





II. Exp. 2: Survey of Microbes

2. **Protozoa**: single celled eukaryotic microbes that move by different methods that belong to the Protista kingdom.

- **Pseudopods**: false feet

Amoeba

- **Cilia**

Paramecium

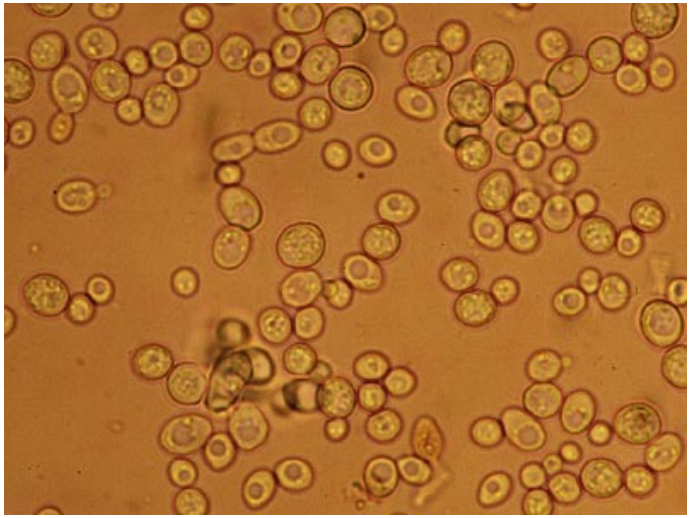
- **Flagella**

Euglena

II. Exp. 2: Survey of Microbes

3. Yeast: single celled eukaryotic microbes that belong to the Fungi kingdom

- Ovoid & irregular
- Budding: method of reproduction
- Brownian movement
- Smaller than protozoa
- Larger than bacteria



II. Exp. 2: Survey of Microbes

4. Bacteria (Hay infusion): single celled prokaryotic microbes that belong to the Monera kingdom.

- Must view under 400x
- Very small
- Motile & non-motile
- Looks like specks of sand
- Hard to discern shape
- Smaller than yeast & protozoa
- Protozoa may be present in the sample

Overview

I. Exp. 1: Introduction to the Microscope

II. Exp. 2: Survey of Microbes

III. Exp. 3: Collection of Microbes

III. Exp. 3: Collection of Microbes

- **Purpose:** To collect and grow microbes from the environment for observation
  - Procedure to be described by lab instructor