



The

# BioScope Initiative

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## Cell Structure & Function – Content Outline

### 1. Cell Structure

### 2. Cell Function

### 3. Microscopes and Microscopy

#### 1. Cell Structure

##### a. Introduction

Cells – the basic unit of life

##### b. Different Types of Cells

Prokaryotic cells

- Bacteria, cyanobacteria

Eukaryotic cells

- Plants, animals, fungi, protozoans
- Tissues and muscles

Typical plant and animal cells viewed through virtual microscopes

- onion
- elodea
- human epithelial
- *E. coli*

##### c. Molecular Components of Cells

##### d. Cell Sizes

Microns

##### e. History of Cell Discovery

The scientists involved:

- |                              |                     |
|------------------------------|---------------------|
| - Hans and Zacharias Janssen | - Marcello Malpighi |
| - Anton van Leeuwenhoek      | - Robert Brown      |
| - Felix Dujardin             | - Robert Hook       |
| - Matthias Schleiden         | - Theodor Schwann   |
| - Rudolph Virchow            |                     |

##### f. The Organelles of Cells

- |                 |                 |
|-----------------|-----------------|
| - cell membrane | - centriole     |
| - centrosome    | - cytoskeleton  |
| - cytosol       | - Golgi vesicle |
| - Lysosome      | - mitochondria  |
| - nucleolus     | - peroxisome    |
| - ribosome      | - RER, SER      |
| - cell wall     | - chloroplast   |
| - cytoplasm     | - leucoplast    |
| - vacuole       |                 |

##### g. Other Cellular Components

- |                         |            |
|-------------------------|------------|
| - DNA                   | - RNA      |
| - MRNA                  | - Enzymes  |
| - Lipids, carbohydrates | - Proteins |

##### h. Specialised Cells

- |              |                  |
|--------------|------------------|
| - Adipocytes | - Skin           |
| - Blood      | - Tissue         |
| - Organs     | - Chromatophores |

#### 2. Cellular Function and Processes

##### a. Energy

- Cellular Respiration
- Photosynthesis

##### b. The Cell Cycle

- |                        |                      |
|------------------------|----------------------|
| - Cell division        | - Mutations in genes |
| - Abnormal cell growth | - Gene p53           |
| - Cancer               |                      |

- c. Cellular Communication
  - the development of Acne
  - Cell Receptors
  - Tissue Inflammatory Response
  - Neurons and messages
  - Hormones
- d. Organelles Responses and Cell Damage
  - Steroids and cell reactions
  - Antibiotics and cell reactions
  - Chromatophore Response
  - Effects of Drugs
    - alcohol
    - tobacco
    - cocaine
    - marijuana
    - steroids
  - Environmental pollutants
    - lead
    - pesticides

- Cell Behaviour
- White Blood Cells
- Binding molecules
- Cell Membrane Proteins
- Enzymes and Lipids
  
- Body shapes
- Beta Adrenergic Hormone

### 3. Microscopes and Microscopy

- a. The Principles of Microscopy
  - magnification
  - depth of field
  - refraction
  - oil immersion
- b. The Types of Microscopes
  - light
  - confocal
  - inverted
  - Differential Interference Contrast
- c. Using Light Microscopes
  - Electric light microscopes
  - Mirror light source
  - Parts of a light microscope
    - Ocular lens
    - Coarse adjustment
    - High powered objective and Low powered objective
    - Stage and Stage clips
    - Mirror
    - Fine adjustment
    - Base
    - Arm
- d. Stains and their Uses
  - Iodine
  - Methylene blue
  - Trypan blue
- e. Slide preparation
  - Onion skin
  - Drawing blood and Blood smear
- f. History of Microscopy
  - Anton Van Leeuwenhoek
  - Marcello Malpighi
  - Matthias Schleiden
  - Simple lens microscope
  - First microscopes
- g. The Development of the Cell Theory
  - Robert Hooke
  - Matthias Schleiden
  - Theodor Schwann
  - Rudolph Virchow

- resolution
- focal point
- refractive index
- numerical aperture

- electron
- fluorescence
- digital light
- Atomic Force

- Carbol fuchsin
- Acridine orange

- Cheek epithelial cells

- Robert Hooke
- Robert Brown
- Hans & Zacharias Jannsen

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