



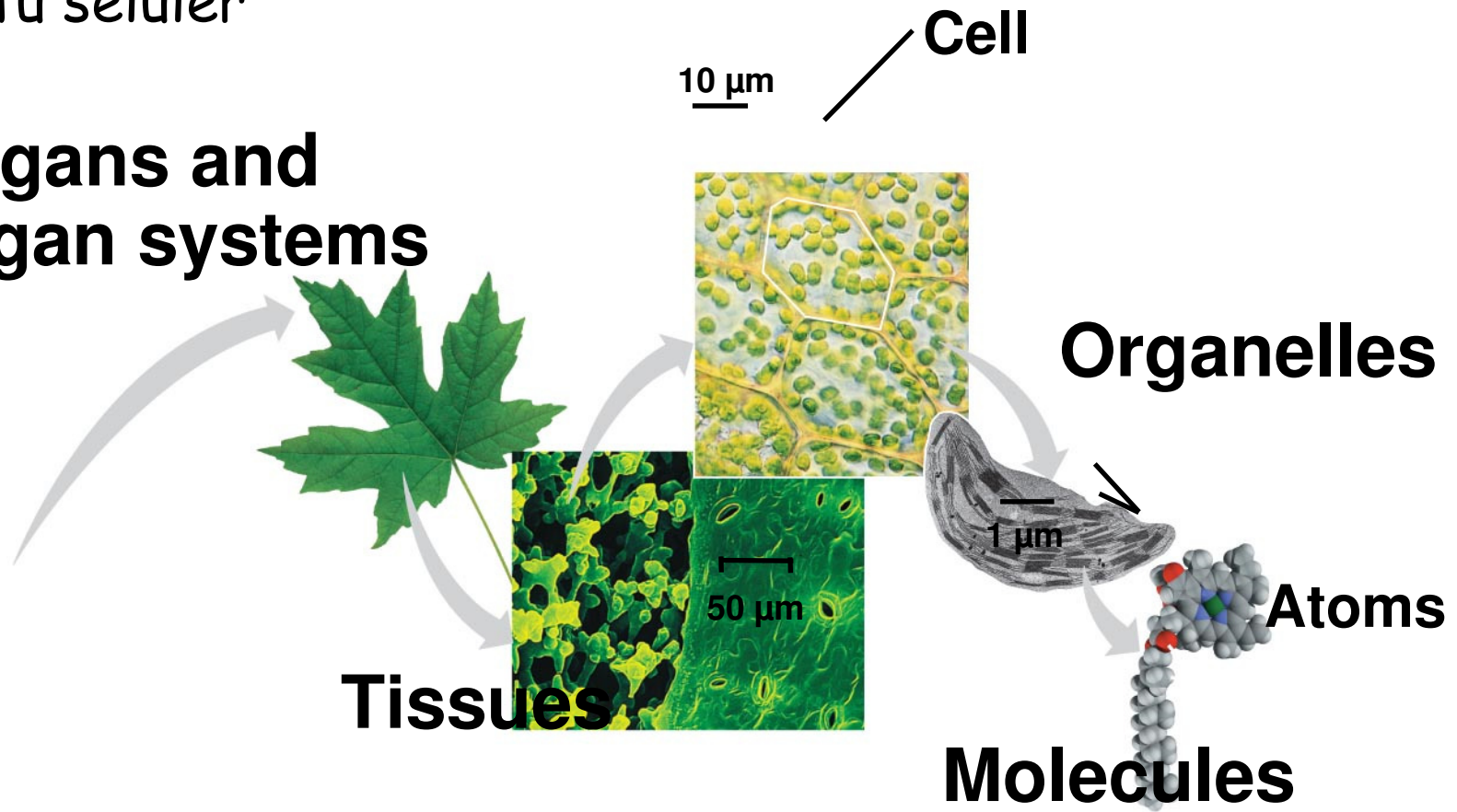
Cells

Introduction

- Both living and non-living things are composed of molecules made from chemical elements such as Carbon, Hydrogen, Oxygen, and Nitrogen. The organization of these molecules into cells is one feature that distinguishes living things from all other matter. **The cell is the smallest unit of matter that can carry on all the processes of life.**

- Suatu individu organisme, merupakan suatu sistem yang terorganisir; yang tersusun dari tingkatan yang terkecil, yaitu seluler

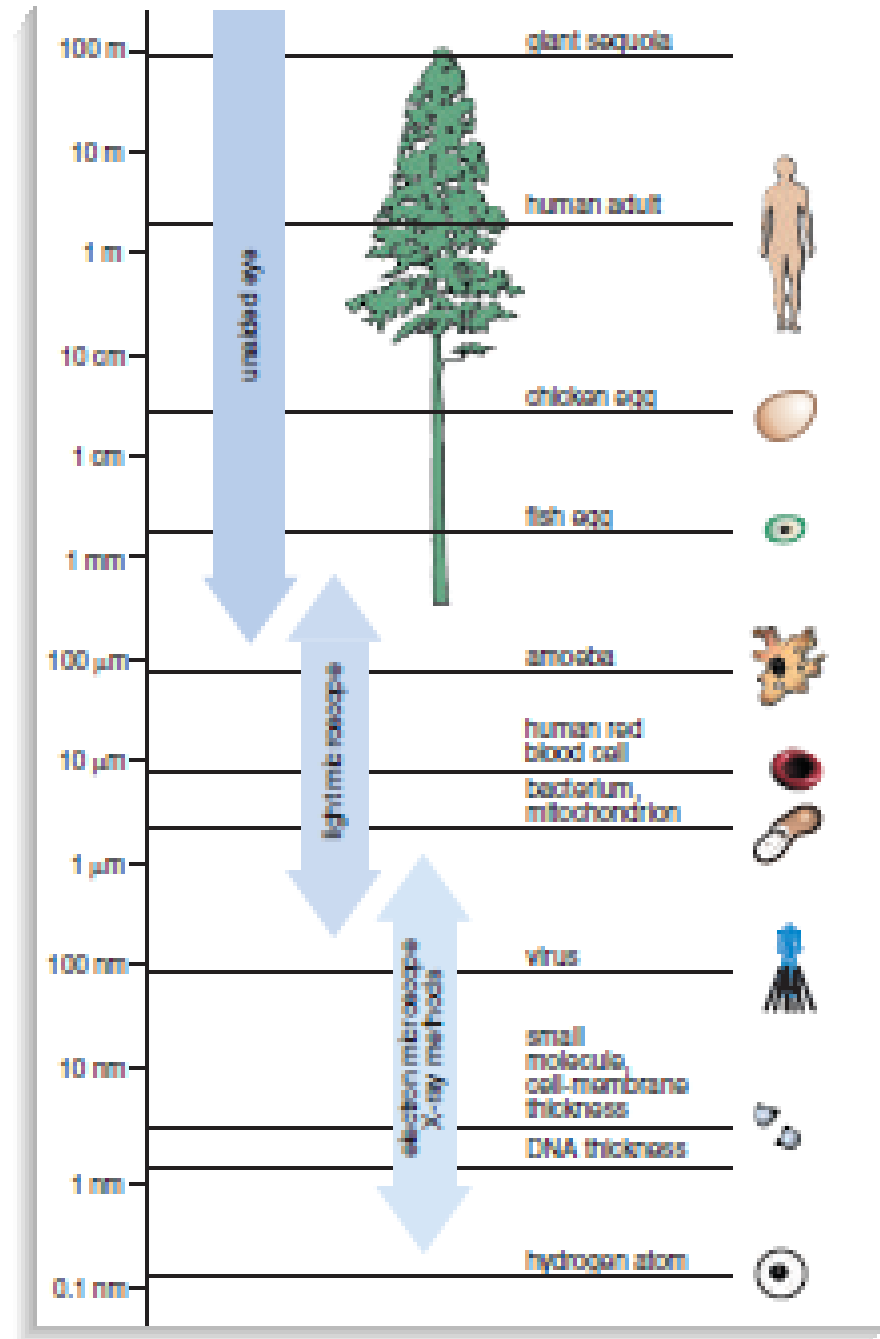
Organs and organ systems



- Not all cells are alike. Even cells within the same organism show enormous diversity in size, shape, and internal organization. Your body contains around 10^{13} to 10^{14} cells of around 300 different cell types, which we broadly classify into 4 groups.

Connection

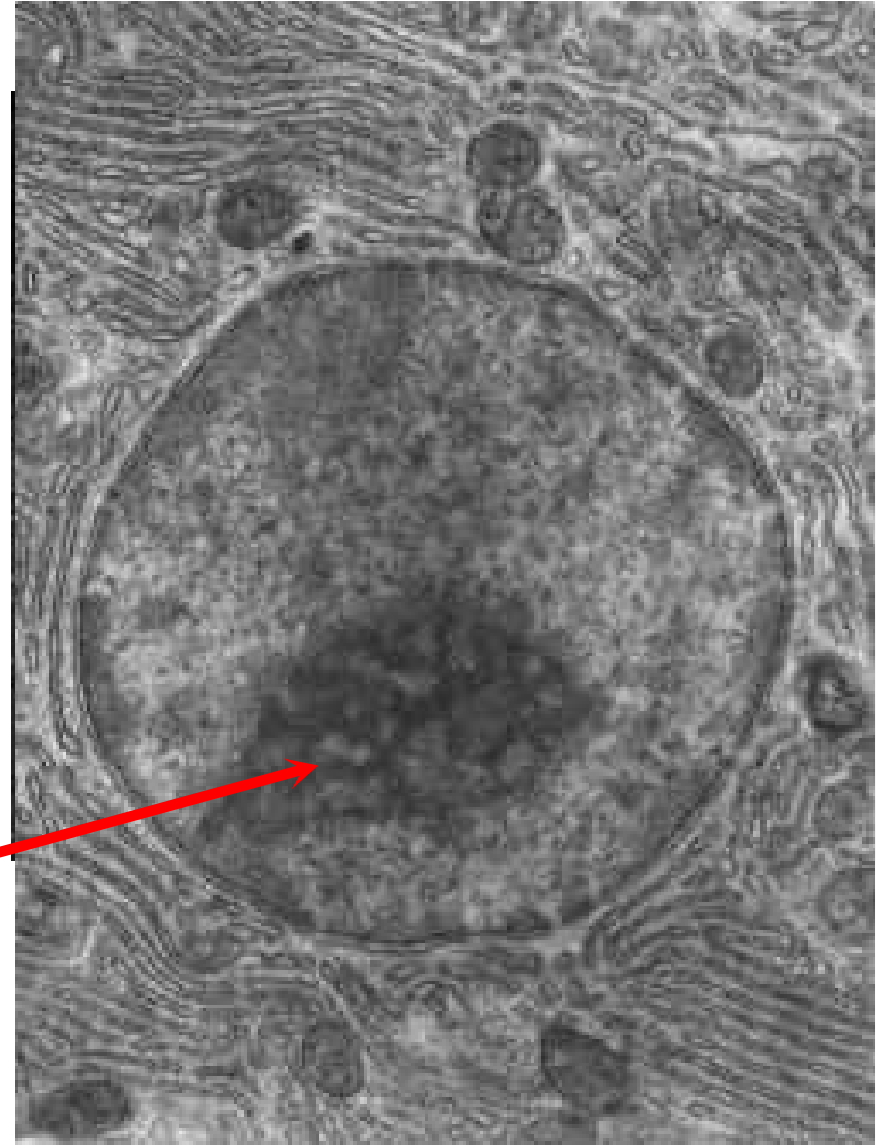
Comparison Cell Size vs Other object



Don't copy down this slide – just listen

Microscopes and Cells: History

- In 1663, Robert Hooke coined the term “cells”
- 10 years later, Anton van Leeuwenhoek observed bacteria and protozoa
- In 1833, Robert Browne observed and coined the term “nucleus”



Cell Theory:

- In 1838 (and 1839)
German scientists,
Matthias Schleiden
&
Theodore Schwann
independently came
up with the
“Cell Theory”

Guten Tag, Dr. Shwann

Guten Tag, Dr. Schleiden

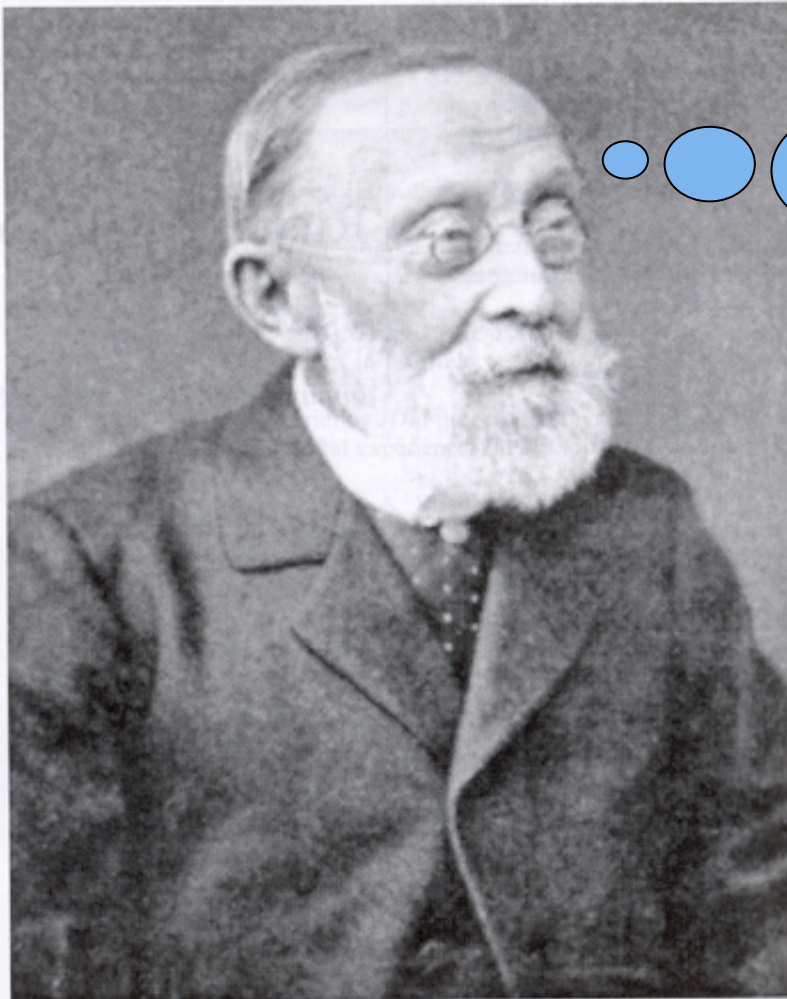
It appears we have come
up with a very similar
theory...

What shall we call this
theory?

Cell Theory

- **Cell Theory** consists of **three** principles:
- a. All living things are composed of **one or more cells**.
- b. Cells are the **basic units of structure and function** in an organism.
- c. Cells come only from the **replication of existing cells**.

- In 1855, German physician Rudolph Virchow discovered that...



*all cells must
come from
pre-existing
cells.*

Please add the above as point #4 to the cell theory

The modern version of the Cell Theory :

- *Energy flow occurs within cells.*
- *Heredity information (DNA) is passed on from cell to cell.*
- *All cells have the same basic chemical composition.*

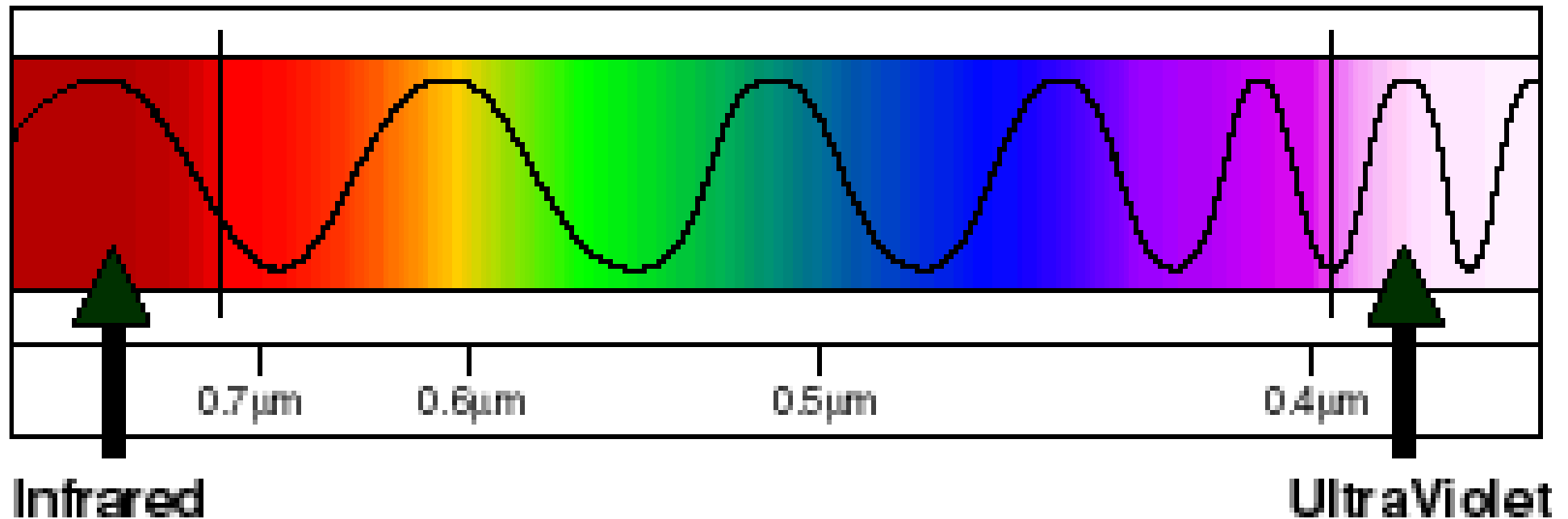
The cell theory, in its modern form, includes the following three principles

1. All organisms are composed of one or more cells, and the life processes of metabolism and heredity occur within these cells.
2. Cells are the smallest living things, the basic units of organization of all organisms.
3. Cells arise only by division of a previously existing cell. Although life likely evolved spontaneously in the environment of the early earth, biologists have concluded that no additional cells are originating spontaneously at present. Rather, life on earth represents a continuous line of descent from those early cells.

Note:

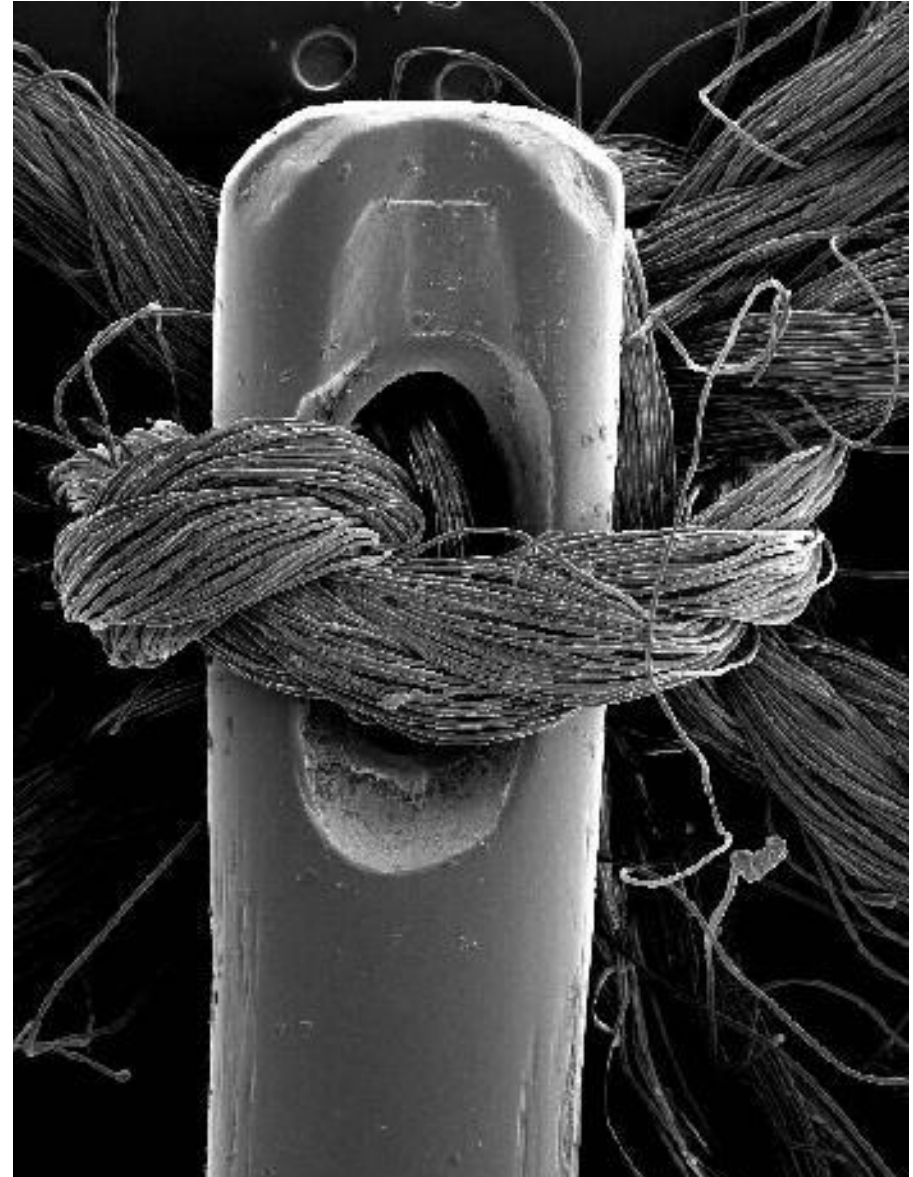
- Cell as a unit structural
-----→ Cells are built up the tissues
- Cell as a unit functional
----→ Cell can do process of life
(metabolism)

Visible Light Region of the Electromagnetic Spectrum



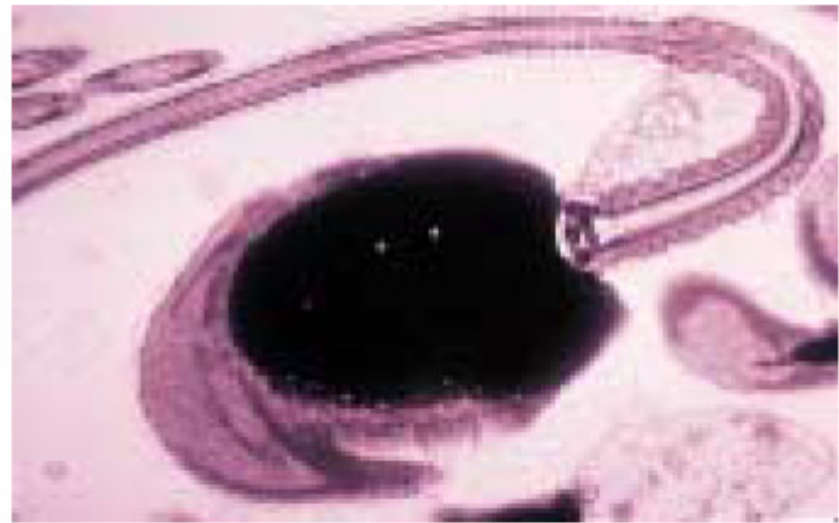
Electron Microscopy

- Transmission Electron Microscopes (TEM) *emit light through* a thin piece of heavy metal ion stained tissue
- Scanning Electron Microscopes (SEM) *reflect light off* of a piece of heavy metal ion stained tissue





(a)



(b)



(c)

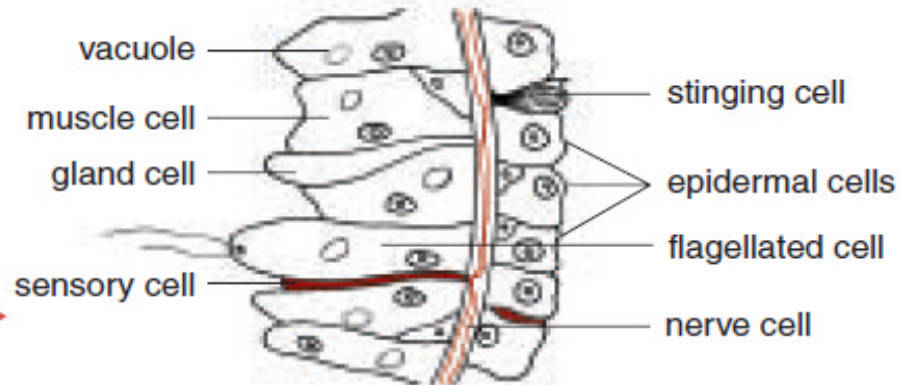
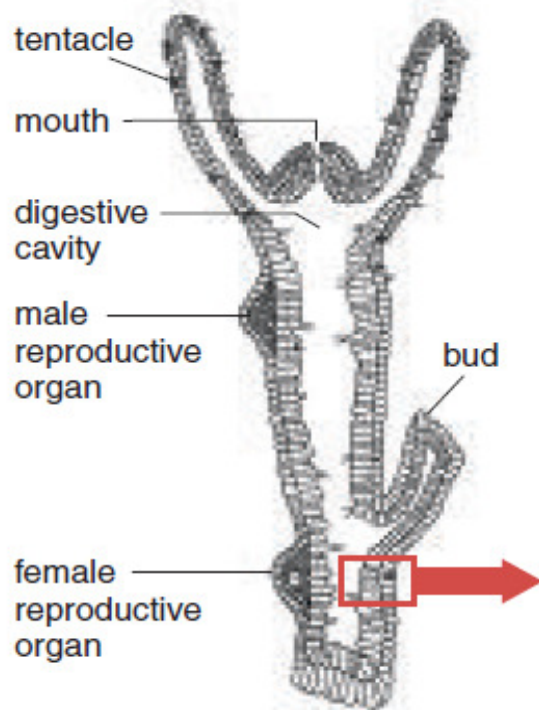
FIGURE 5.3

Human sperm cells viewed with three different microscopes. (a) Image of sperm taken with a light microscope.

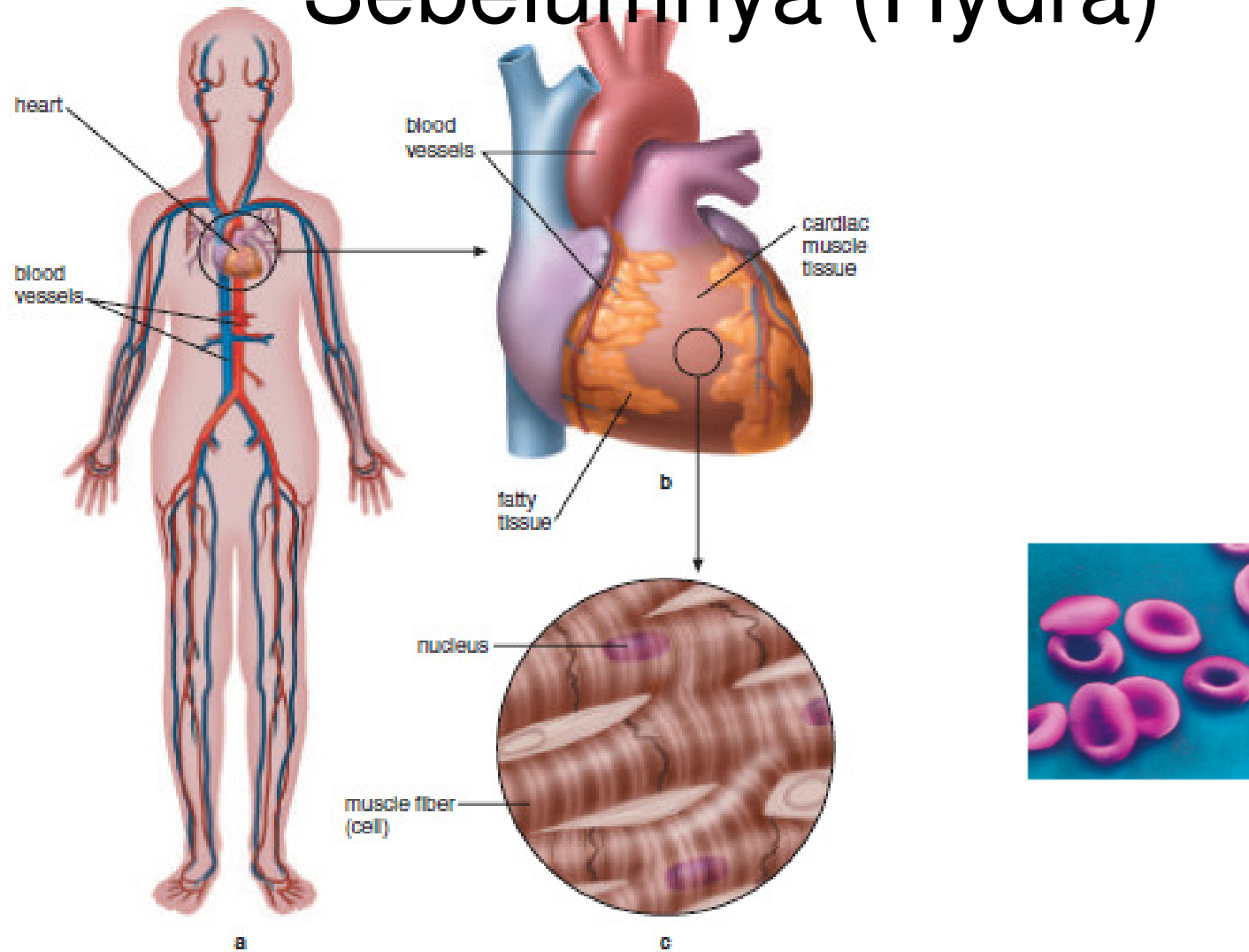
(b) Transmission electron micrograph of a sperm cell. (c) Scanning electron micrograph of sperm cells.

Apply

Amati dengan baik.



Bandungkan dengan Struktur Sel Sebelumnya (Hydra)



- Bagaimana hasil perbandingan struktur sel antara Hydra dan manusia?
- Apa konsekuensinya?

Refleksi

1. What is the cell theory?
2. In what ways does the study of cells depend on technology?
3. In centimeters, how long is your pencil? How does its size compare with that of a bacterium? of a eukaryotic cell?
4. Biologists have been able to keep isolated chloroplasts or mitochondria for a few hours or days. Can these structures be considered alive?
5. What is one advantage of using a light microscope rather than a more powerful electron microscope?

Extend

- Apakah sel mengalami pertambahan luas?
- Jelaskan.

Topik untuk minggu depan

- Struktur komponen sel & fungsinya
- Beda sel hewan & tumbuhan
- Akan ada pre tes!