

# Introduction to Physiology Levels of Organisation

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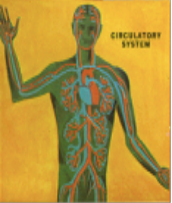
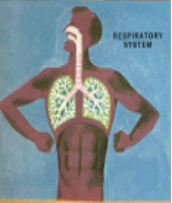
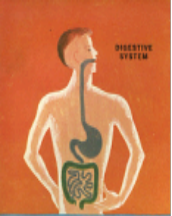
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# Objectives

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- Define physiology.
- Provide an orientation to the subject of human physiology.
- Describe the levels of organisation of an organism.
- The cell is the basic unit of life.
- Describe briefly the basic structure of the cell and state the function of the different cellular organelles.
- Discuss briefly the different levels of organization starting from the cell to body systems giving examples at each level.

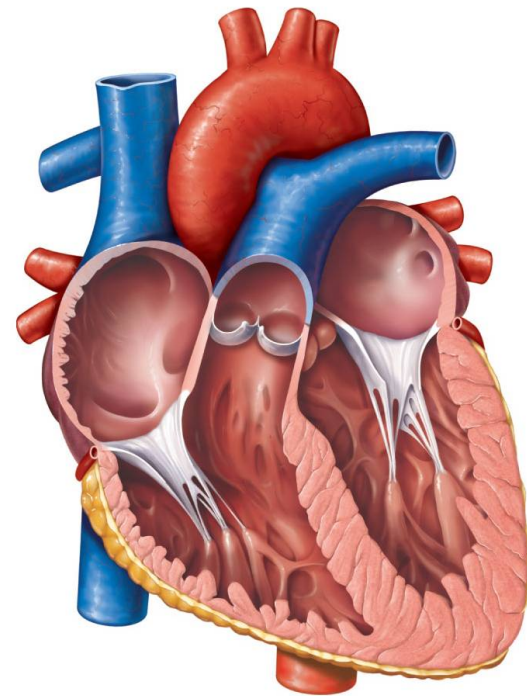
***Study source for this lecture:***

(Guyton & Hall Textbook of Medical Physiology, 13<sup>th</sup> ed, Chapters 1 & 2)

# What is *Physiology*?

- = Physio- + -logy
  - *Physio-*: nature
  - *-logy*: science or study of
- ***Physiology*** = The science dealing with the way a normal organism and their body parts function.
- It is a cornerstone to medicine.

What is the difference between ***anatomy*** and ***physiology*** of the heart?



# How is it Related to Medicine?

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- Many disease states can be viewed as physiology “gone wrong” i.e. ***Pathophysiology***.
- An understanding of physiology is essential for the study and practice of medicine.

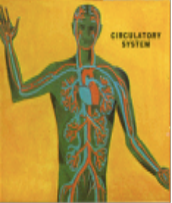
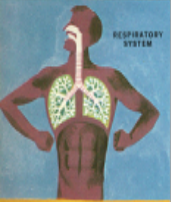
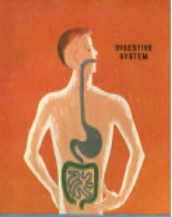




# Food for Thought

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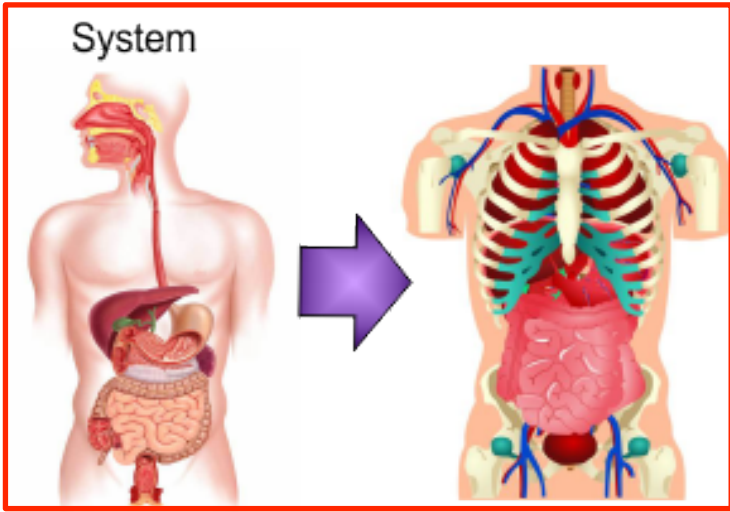
**“A man cannot become a competent surgeon without the full knowledge of human anatomy and physiology, and the physician without physiology and chemistry flounders along in an aimless fashion, never able to gain any accurate conception of disease, practicing a sort of popgun pharmacy, hitting now the malady and again the patient, he himself not knowing which”.**



# How is the Body Organised?

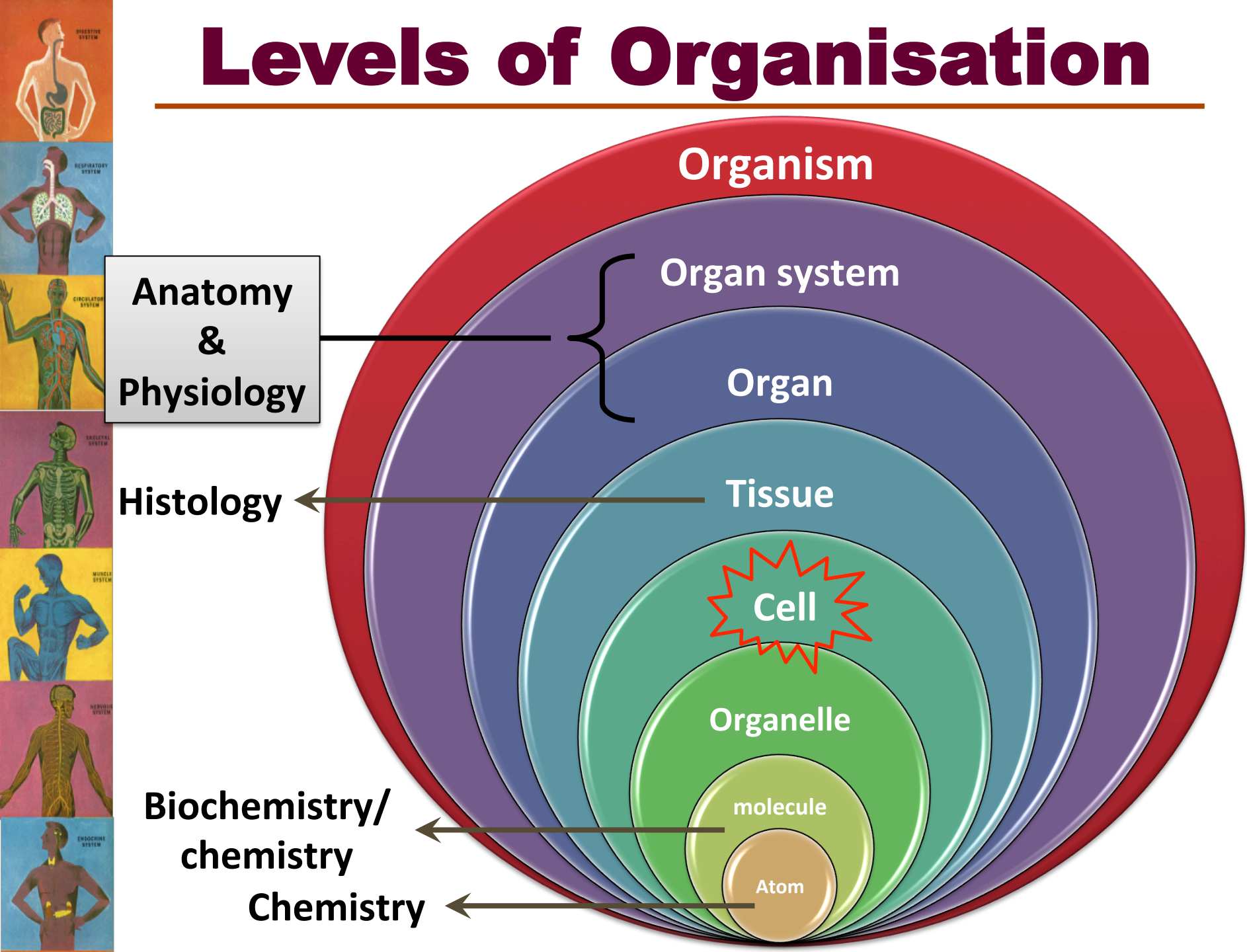


The basic living unit of the body



Human (organism)

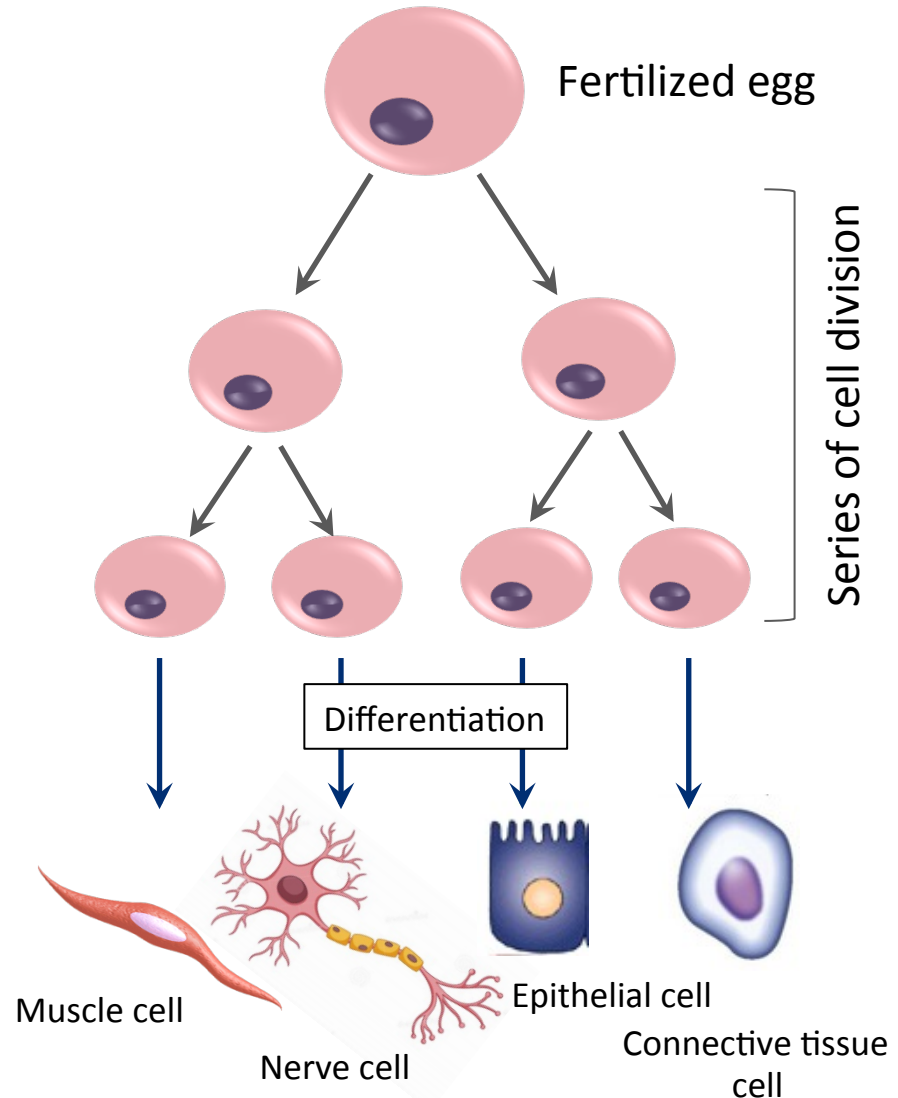
# Levels of Organisation



# “The Cell”

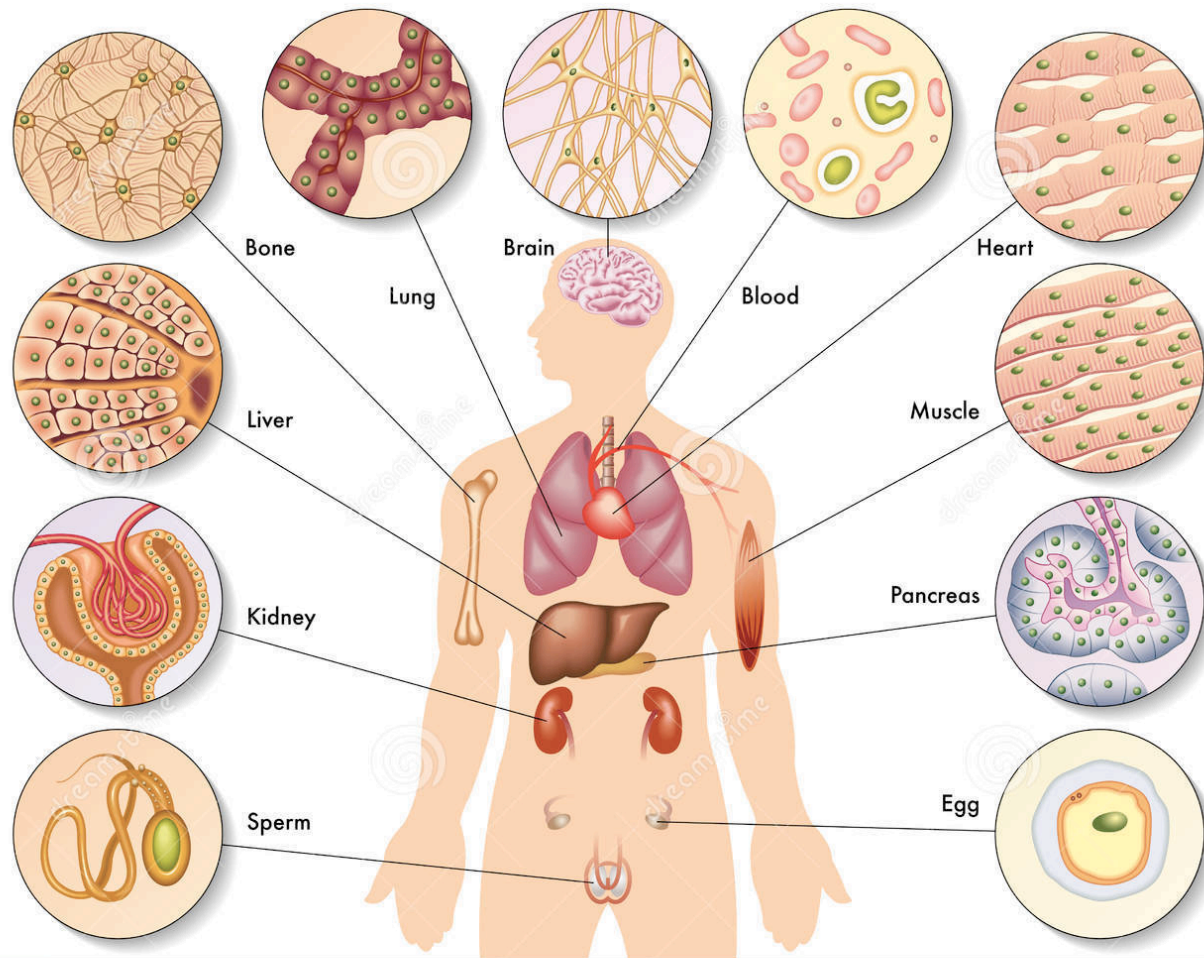
## The Basic Living Unit of the Body

- Each human being begins as a single cell (i.e. fertilized egg).
- The number of cells increase by cellular division.
- The process of transforming an unspecialized cell into a specialized cell is known as **differentiation**.





# The Cell

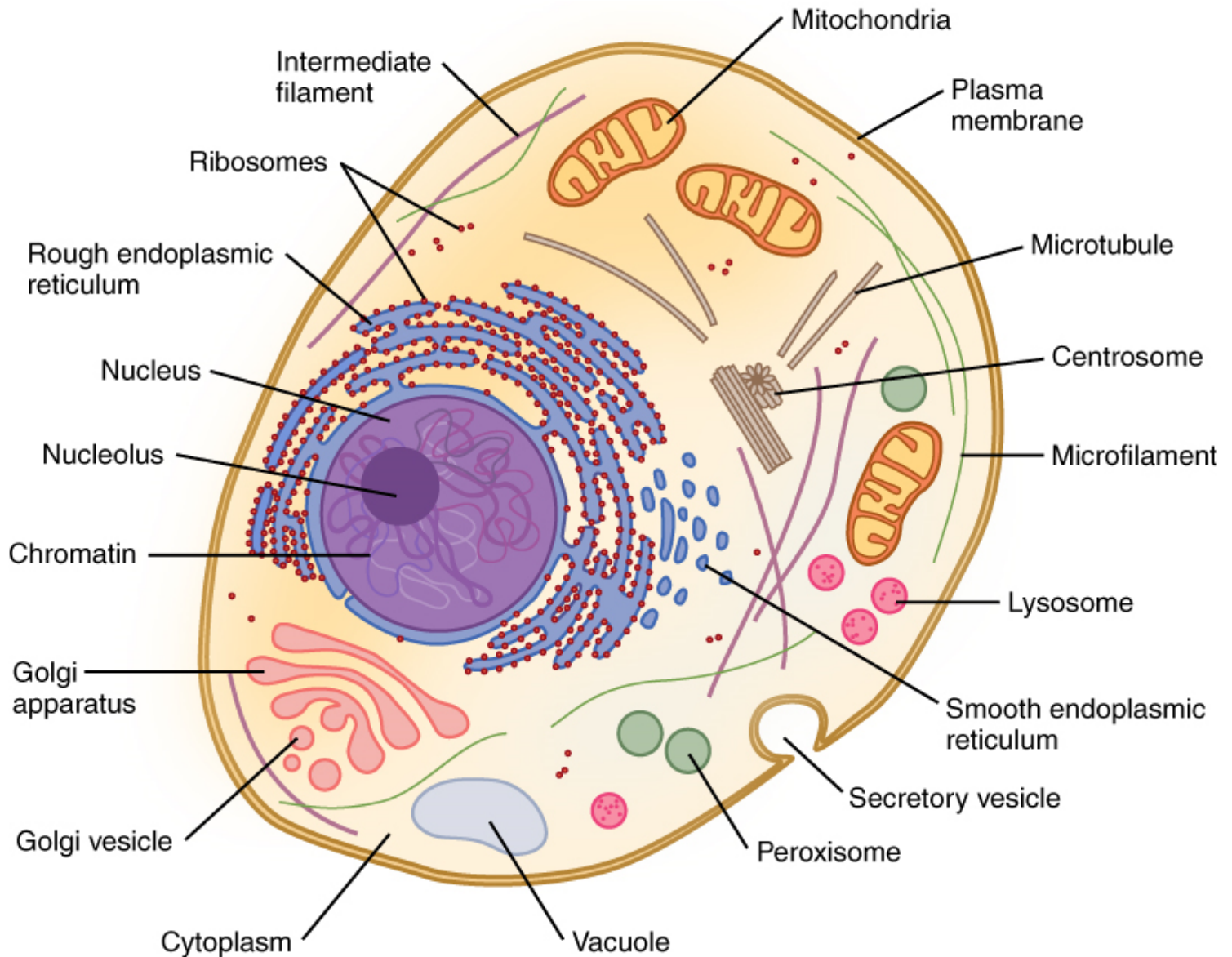


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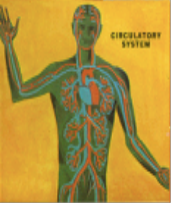
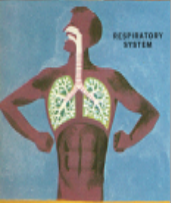
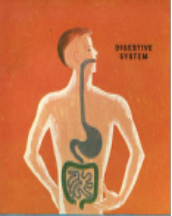
Cells may differ markedly from one another, but they all share certain basic characteristics.

# Cell Structure





# Cell Structure



## Cell organelles

- Nucleus.
- Ribosomes.
- Endoplasmic reticulum:
  - Rough
  - Smooth
- Golgi apparatus.
- Mitochondria.
- Lysosomes.
- Peroxisomes.
- Cytoskeleton.

## Cell membrane

- Will be discussed in a future lecture.

***What is the function of each?***

# Tissues

A collection of a single type of specialized cells = *tissue*.

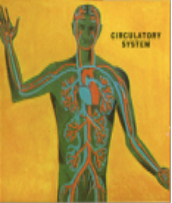
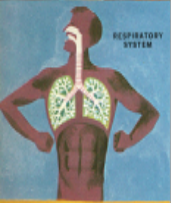
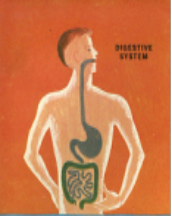
The four major tissue types in the body

Muscle tissue

Nervous tissue

Epithelial tissue

Connective tissue

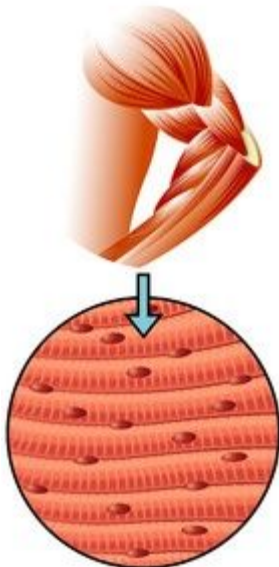


# Muscle Tissue

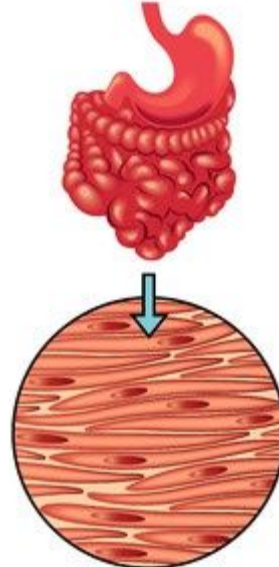
**Muscle tissue** is specialized to generate mechanical force i.e. cause movement.

Three types of muscle cells/  
tissue

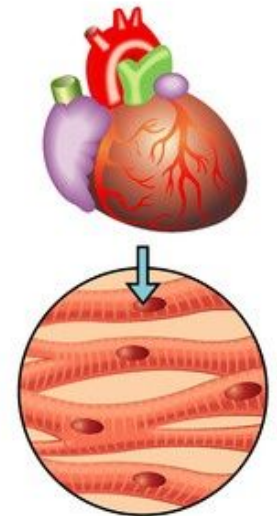
Skeletal muscle



Smooth muscle



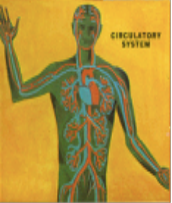
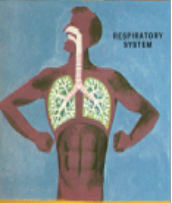
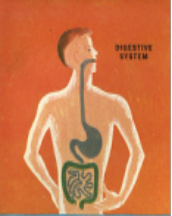
Cardiac muscle



# Nervous Tissue

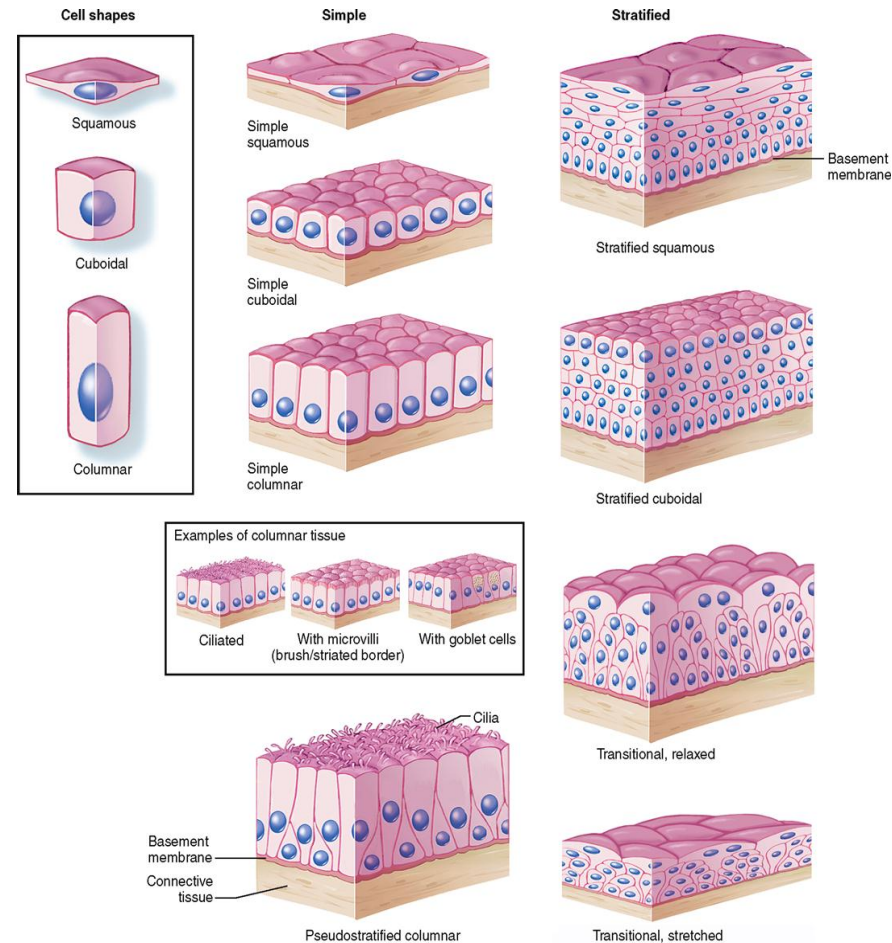
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- Is specialized to initiate, integrate, and conduct electrical signals to other cells.
- These signals may;
  - Initiate new electrical signals in other neurons.
  - Stimulate a gland to secrete hormones.
  - Stimulate muscle contraction.



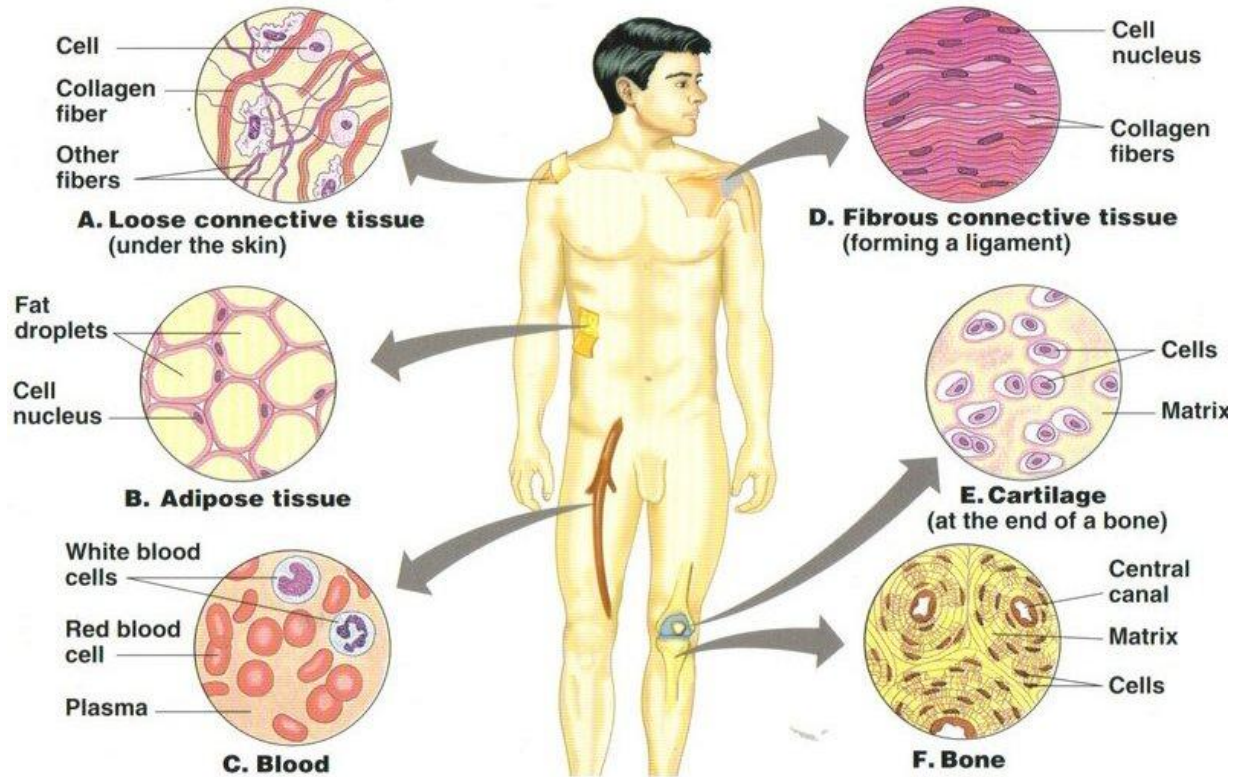
# Epithelial Tissue

- There are many shapes of epithelial cells according to the function they need to perform.
- Thus, there are many types of epithelial tissue.
- ***There are shared properties:***
  - It lines surfaces.
  - Offers protection.
  - May be involved in secretion and absorption of ions & organic molecules.





# Connective Tissue

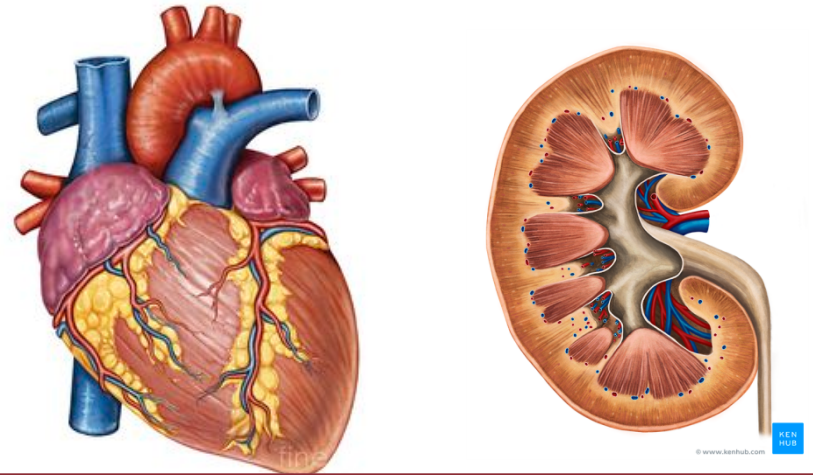


- It connects, anchors and support the structures of the body.
- It consist of many and diverse cell and tissue types, each with its specific function.

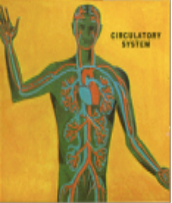
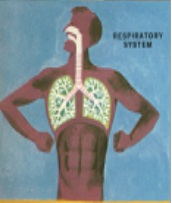
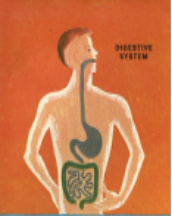


# Organs & Systems

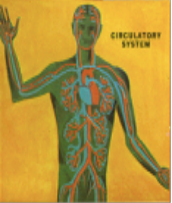
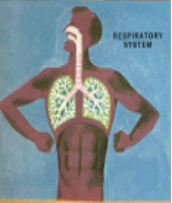
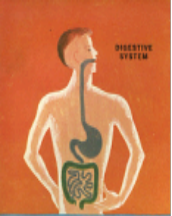
The combination of two or more types of tissues forms an *organ*.



Several organs come together and are organised into a *system*.

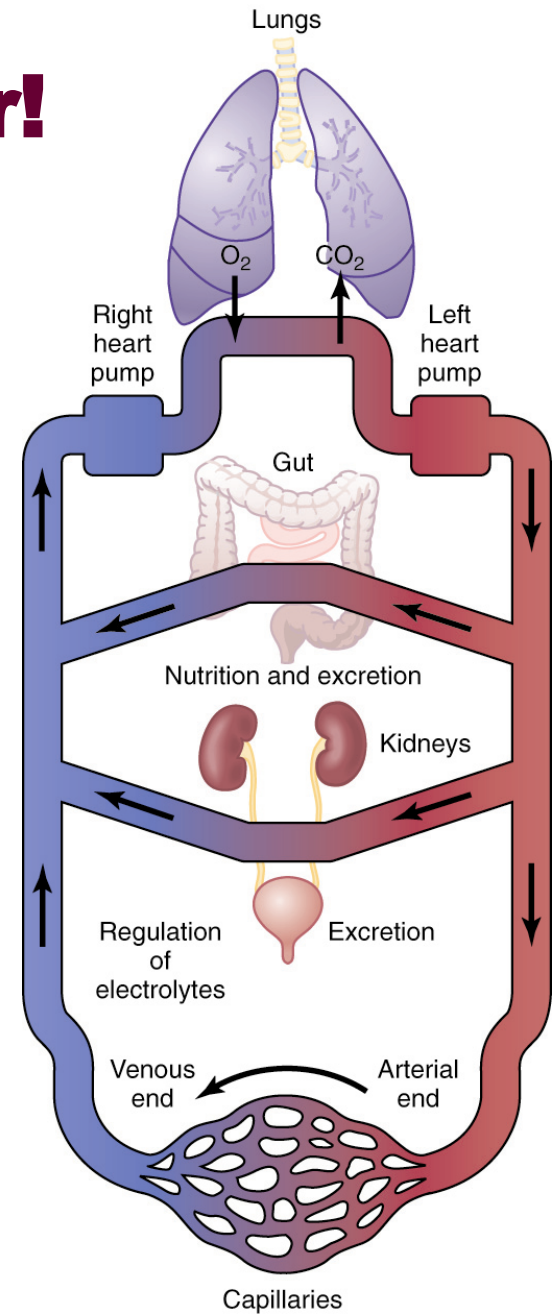
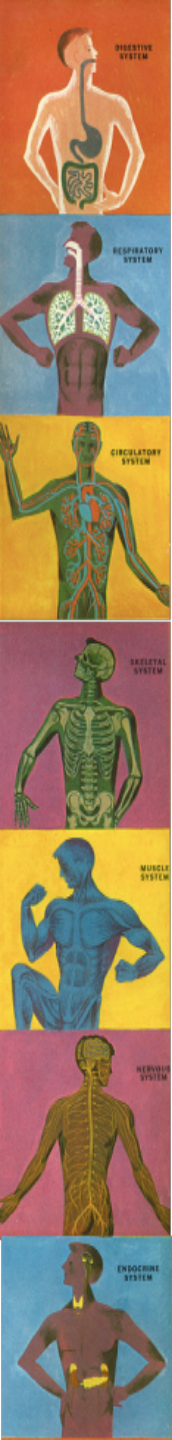


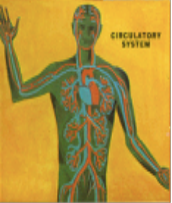
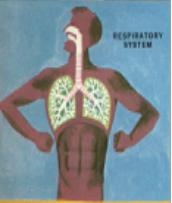
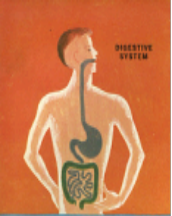
# Systems



System	Major Organs	Primary Functions
Integumentary	Skin, hair, nails	Protection, thermoregulation
Nervous	Brain, spinal cord, nerves	Regulation of other body systems
Endocrine	Hormone-secreting glands, such as the pituitary, thyroid, and adrenals	Secretion of regulatory molecules called hormones
Skeletal	Bones, cartilages	Movement and support
Muscular	Skeletal muscles	Movements of the skeleton
Circulatory	Heart, blood vessels, lymphatic vessels	Movement of blood and lymph
Immune	Bone marrow, lymphoid organs	Defense of the body against invading pathogens
Respiratory	Lungs, airways	Gas exchange
Urinary	Kidneys, ureters, urethra	Regulation of blood volume and composition
Digestive	Mouth, stomach, intestine, liver, gallbladder, pancreas	Breakdown of food into molecules that enter the body
Reproductive	Gonads, external genitalia, associated glands and ducts	Continuation of the human species

# Putting things together!





Thank you