

# Domain 3: Energy

## Part 3

3.4: Cooperative interactions within organisms promote efficiency in the use of energy and matter.

## **COOPERATIVE ENERGETIC STRATEGIES**

# Compartmentalization in Energy Processing

**Compartmentalization** allows for increased cellular efficiency.

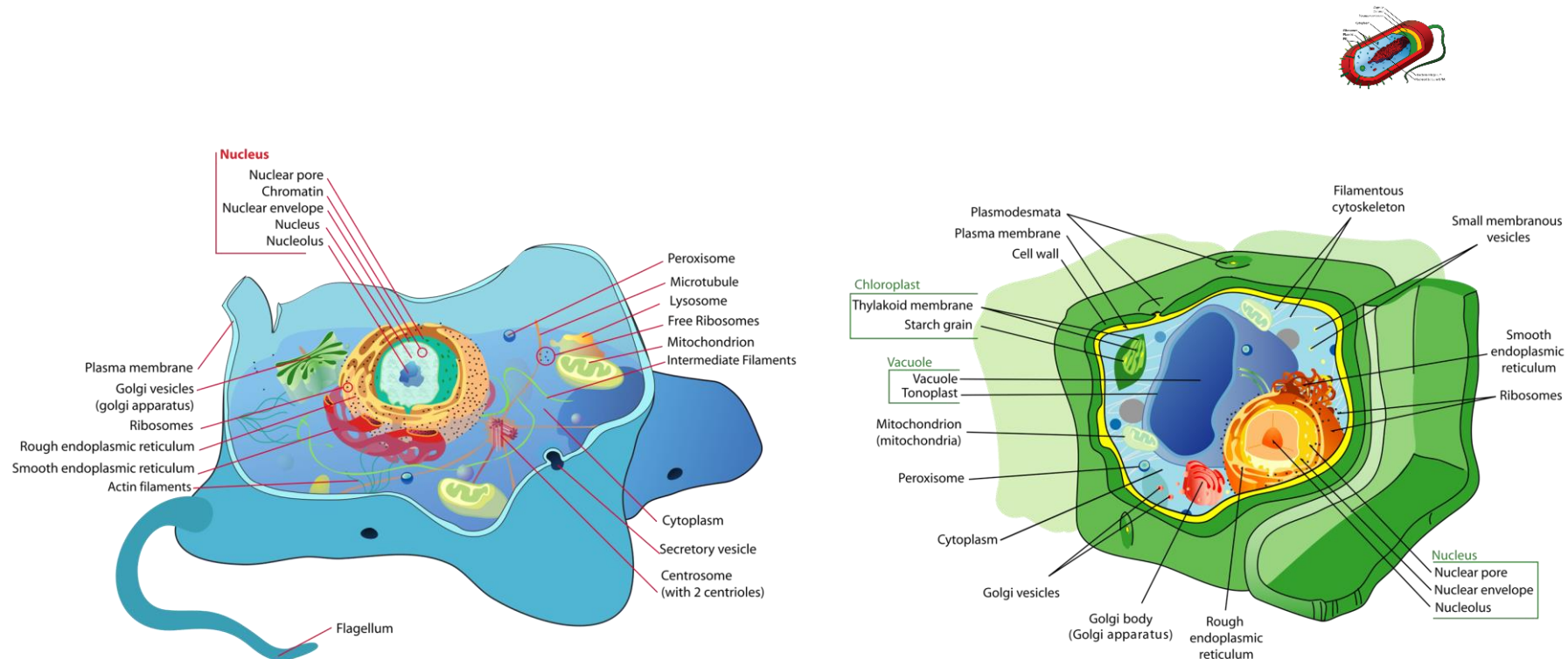
Different metabolic pathways can occur in different cellular compartments, at different conditions, and not interfere with each other.

Groups of related enzymes can also be localized to particular areas.

# Prokaryotes vs. Eukaryotes

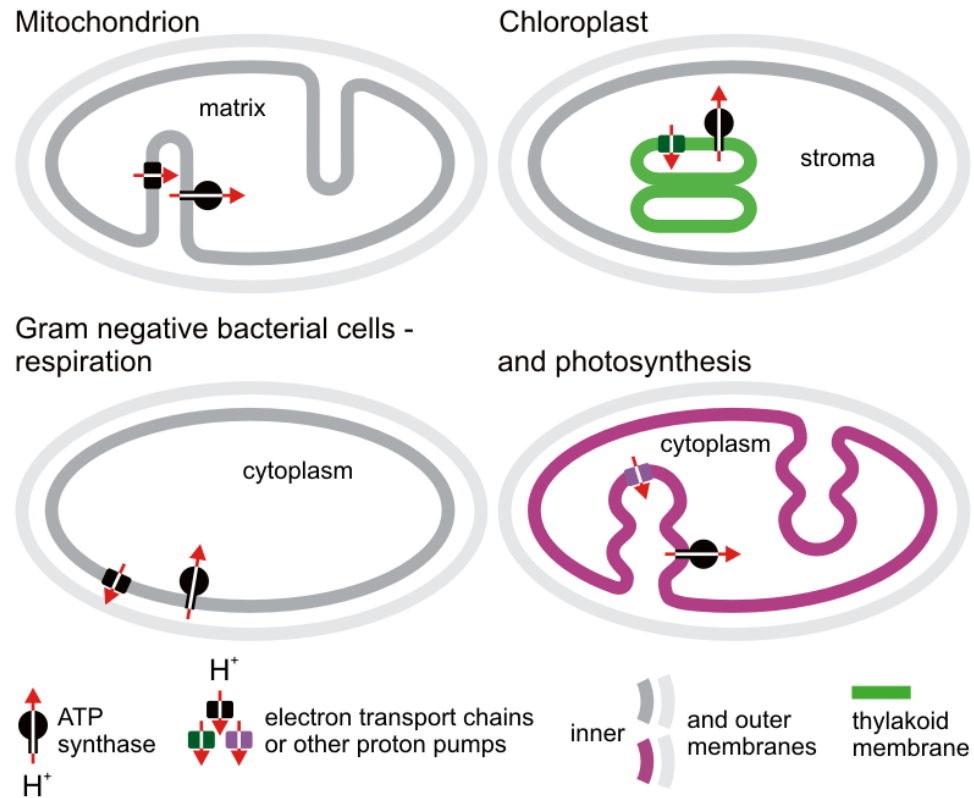
The increased compartmentalization of eukaryotes leads to increased complexity and efficiency.

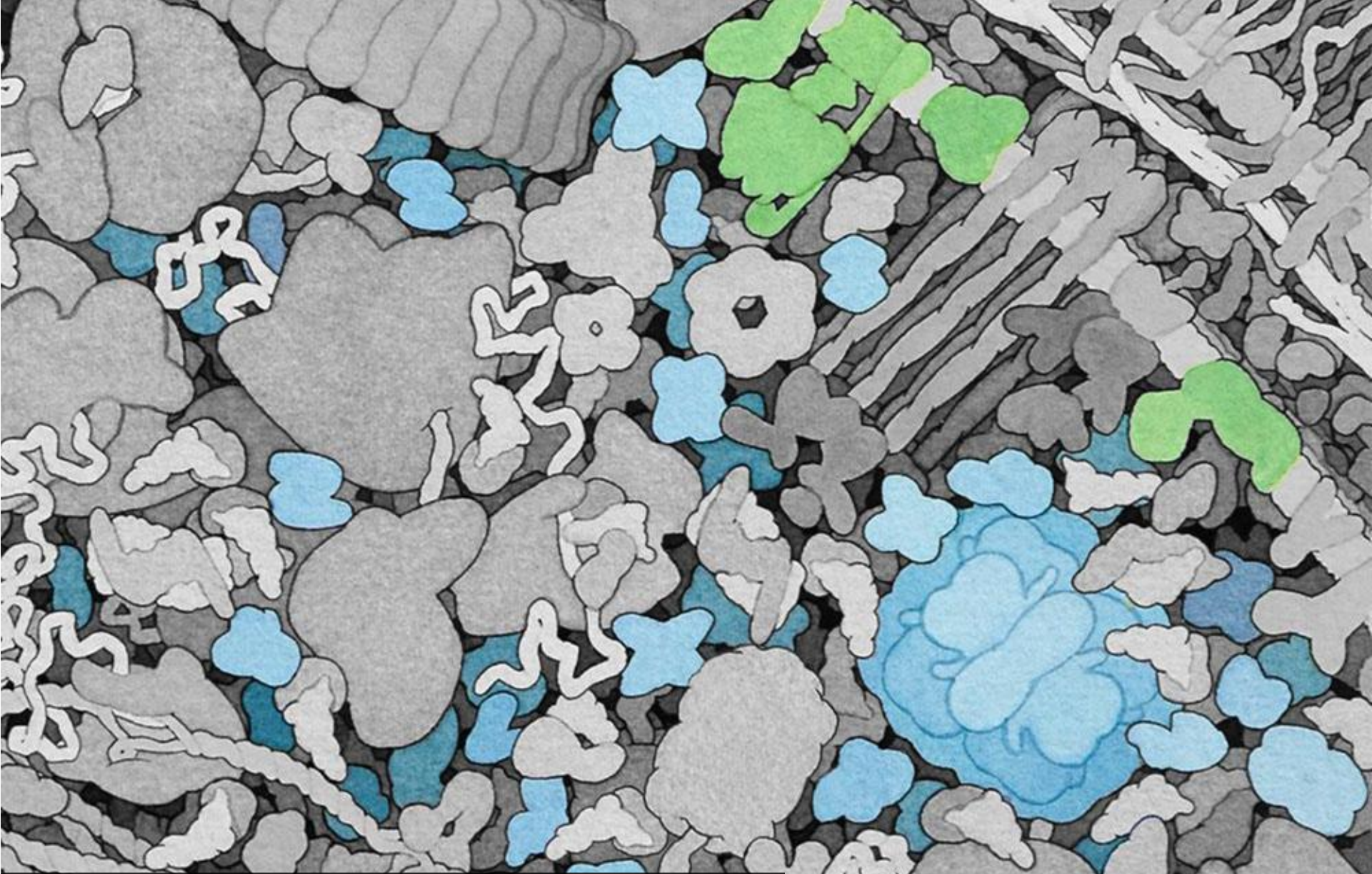
**Note:** To Scale.



# But Don't Forget!

Some prokaryotes are able to carry out aerobic cellular respiration, and photosynthesis. They have adapted their cell membrane into quasi-compartments.





*E. coli's* ATP Synthase is embedded in the **cell membrane**

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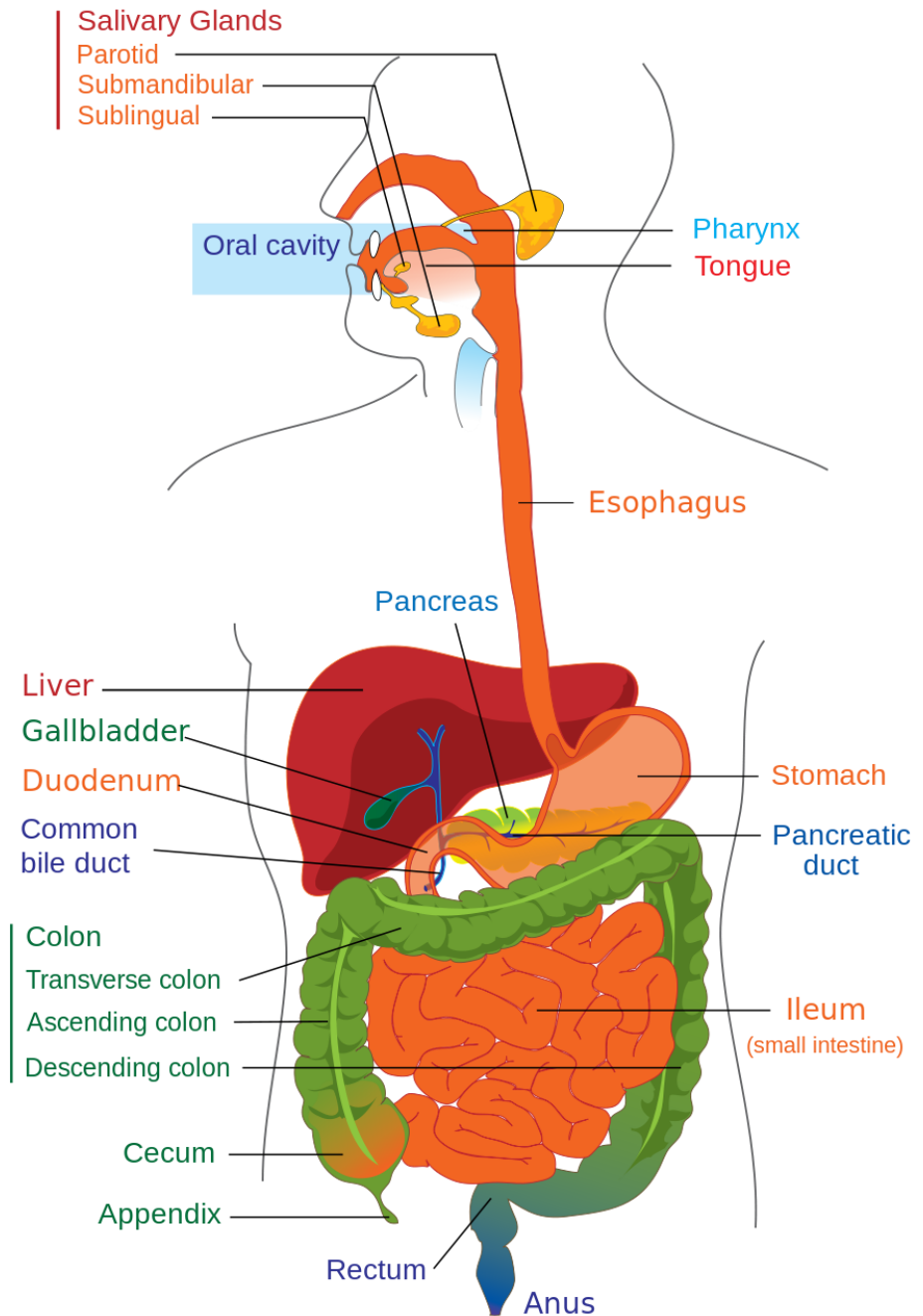
# Multicellular Compartmentalization

Multicellular organisms have compartmentalized **organs** and **organ systems** to increase their efficiency.

All systems work together to accomplish tasks, including metabolism.

# Digestive System

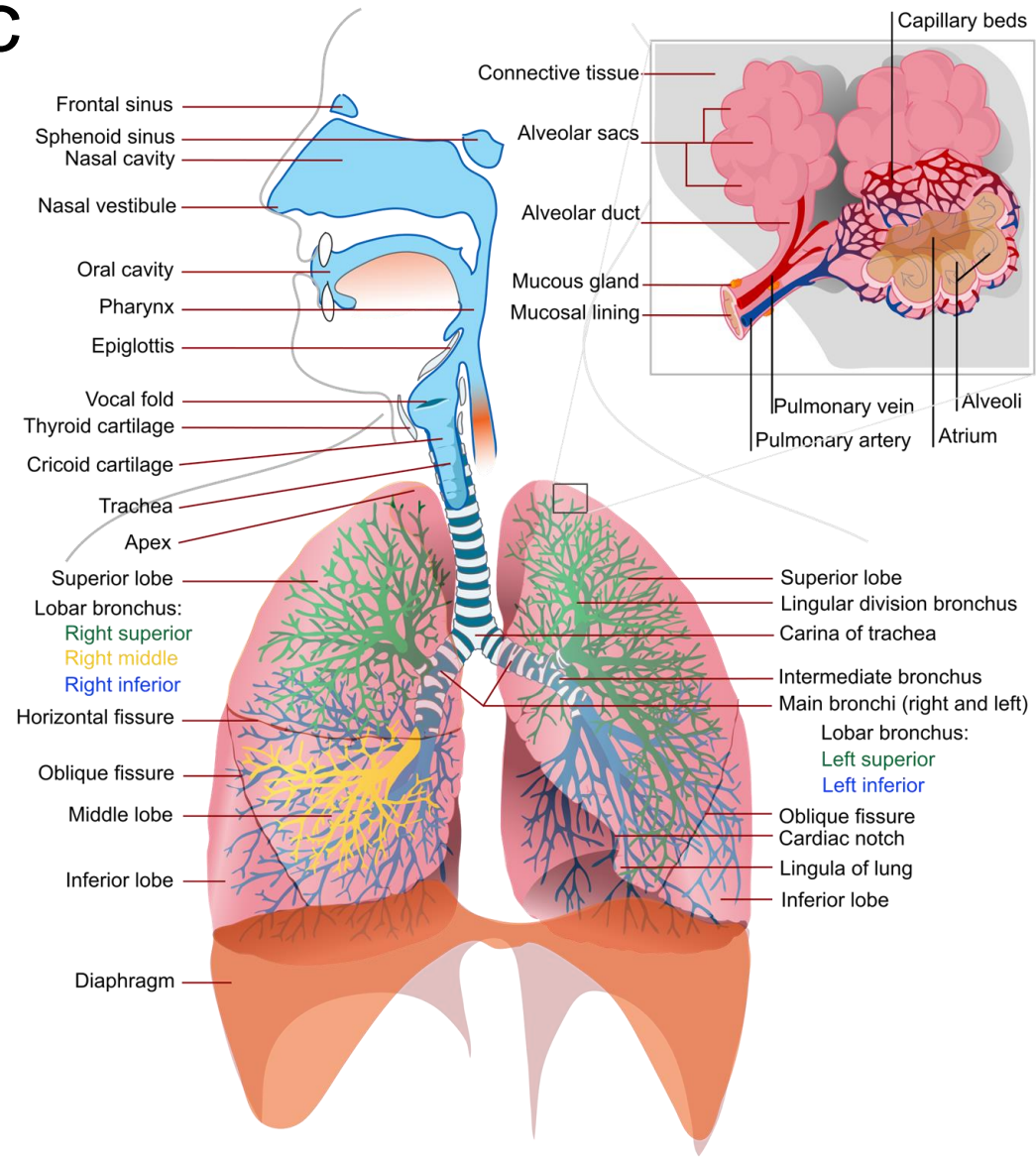
Converts and absorbs complex food molecules into metabolic inputs (ex. starch into glucose)





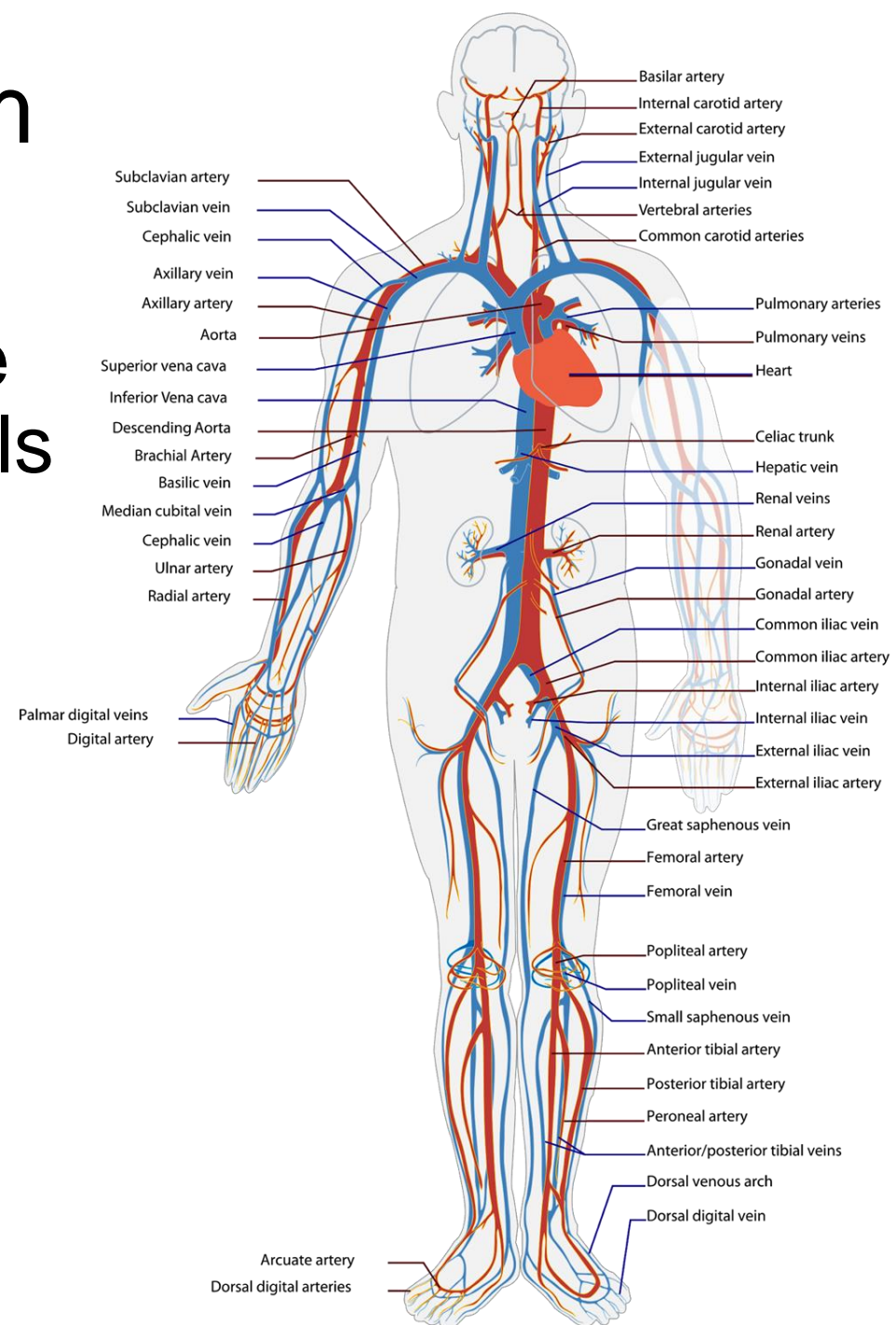
# Respiratory System

Exchanges metabolic gases (oxygen and carbon dioxide)



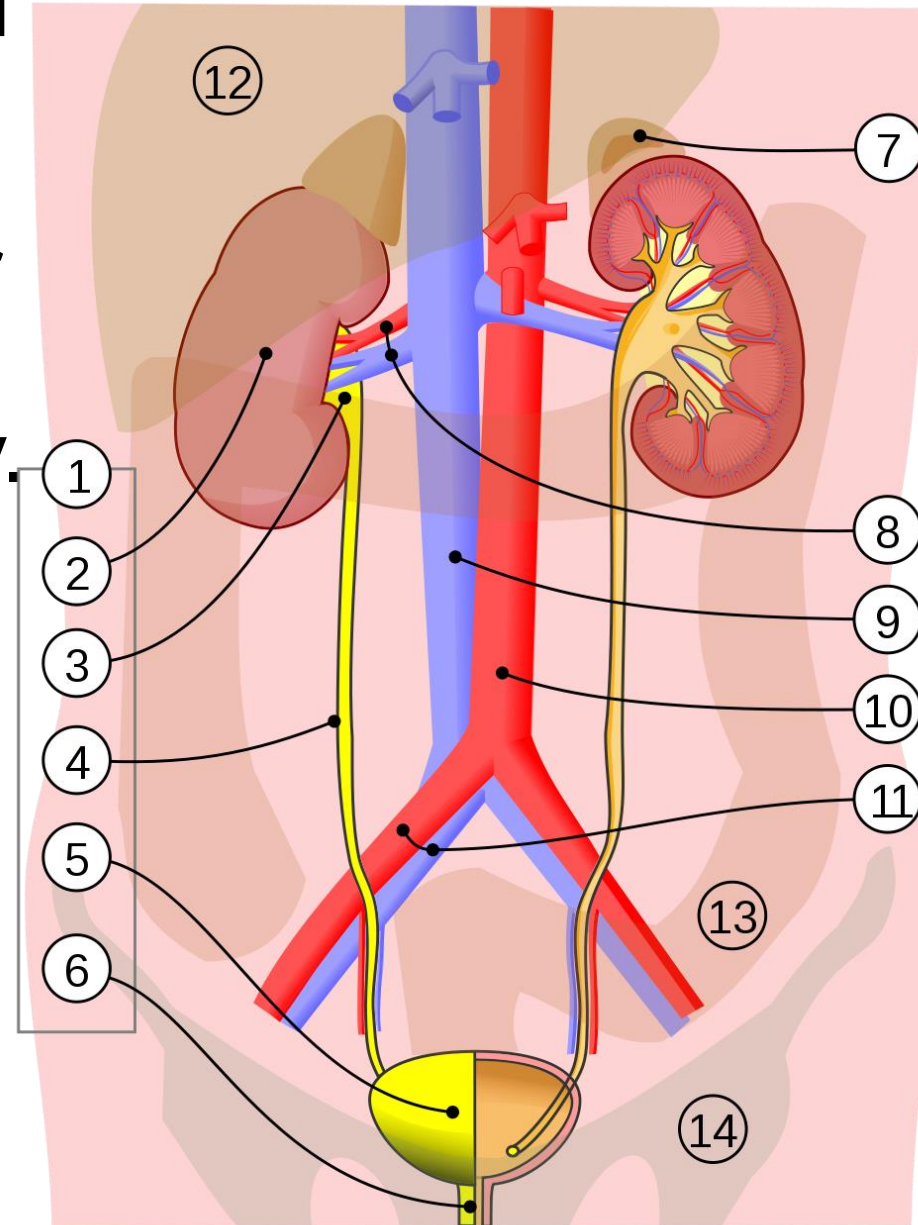
# Circulatory System

Delivery of nutrients and removal of waste products from the cells of the body



# Excretory System

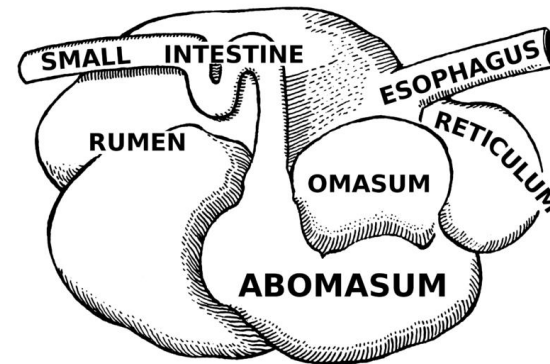
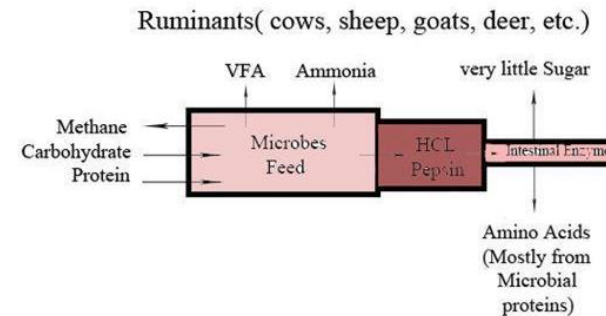
Removal of metabolic waste products (water and nitrogenous wastes) from the body.



# Microbial Cooperation

Communities of microbes will use a diversity of functions to cooperatively accomplish metabolic tasks.

Ex. Animal Rumen Communities



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