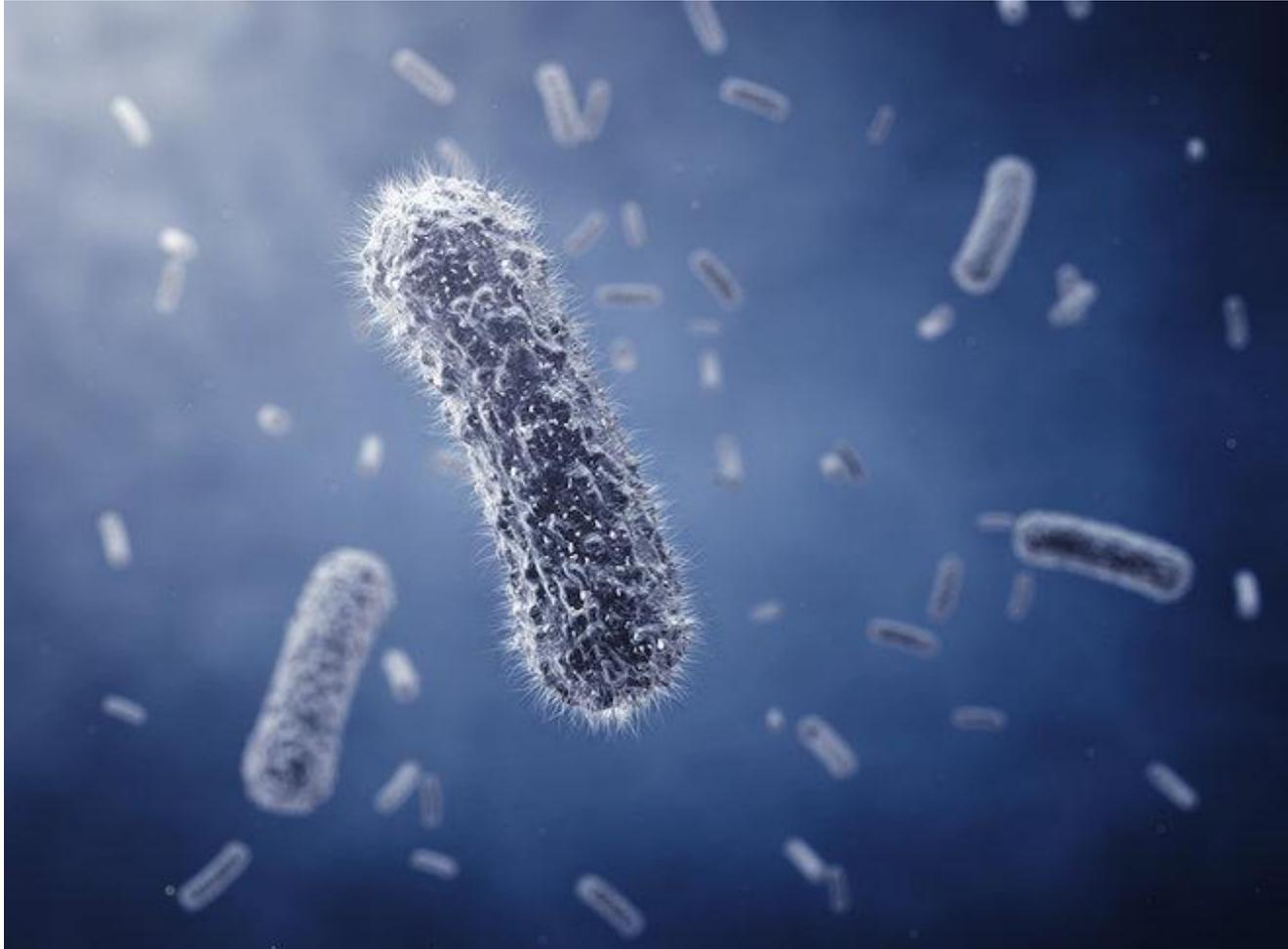


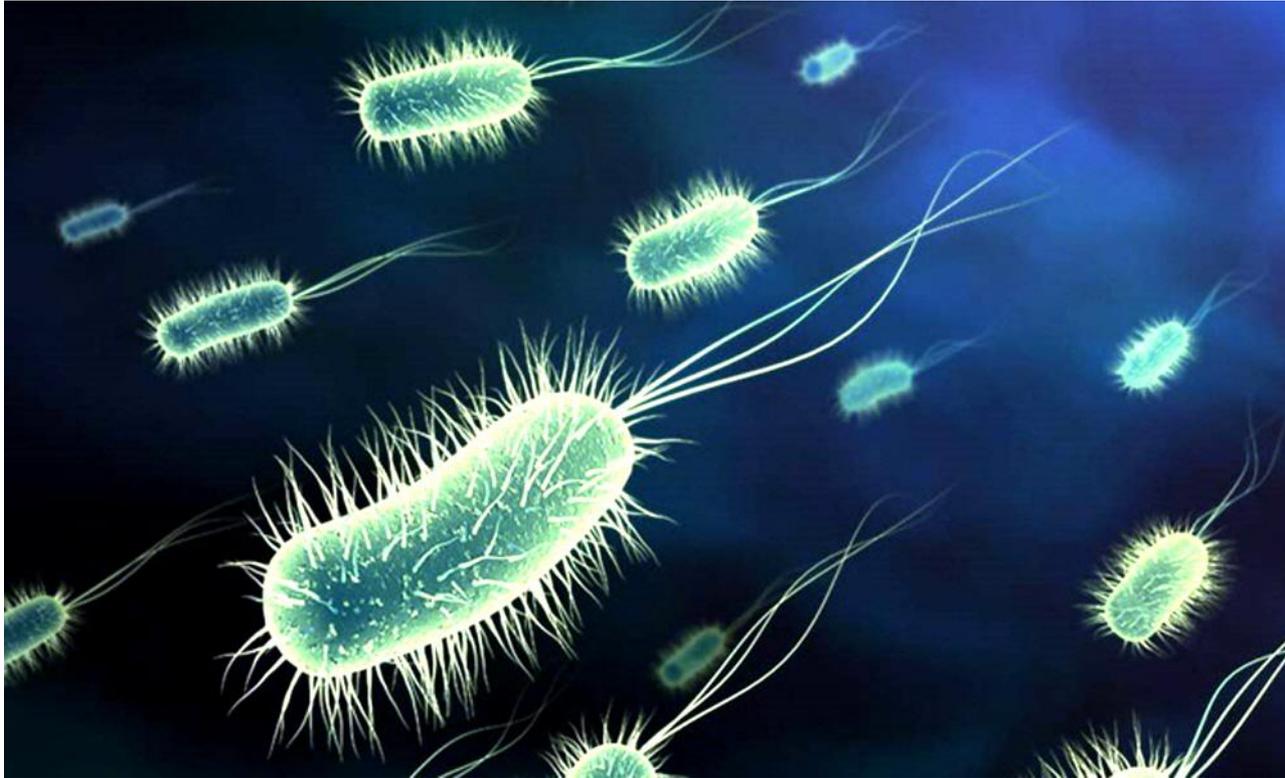
# Prokaryotes and Eukaryotes

- **A prokaryote** is a unicellular organism that lacks a membrane-bound nucleus (karyon), mitochondria, or any other membrane-bound organelle.
- **A eukaryote** is any organism whose cells have a cell nucleus and other organelles enclosed within membranes. Eukaryotic organisms may be unicellular or multicellular. Only eukaryotes form multicellular organisms consisting of many kinds of tissue made up of different cell types.

# Procaryote - bacterium



# Procaryote - bacterium



# Procaryote - cyanobacterium



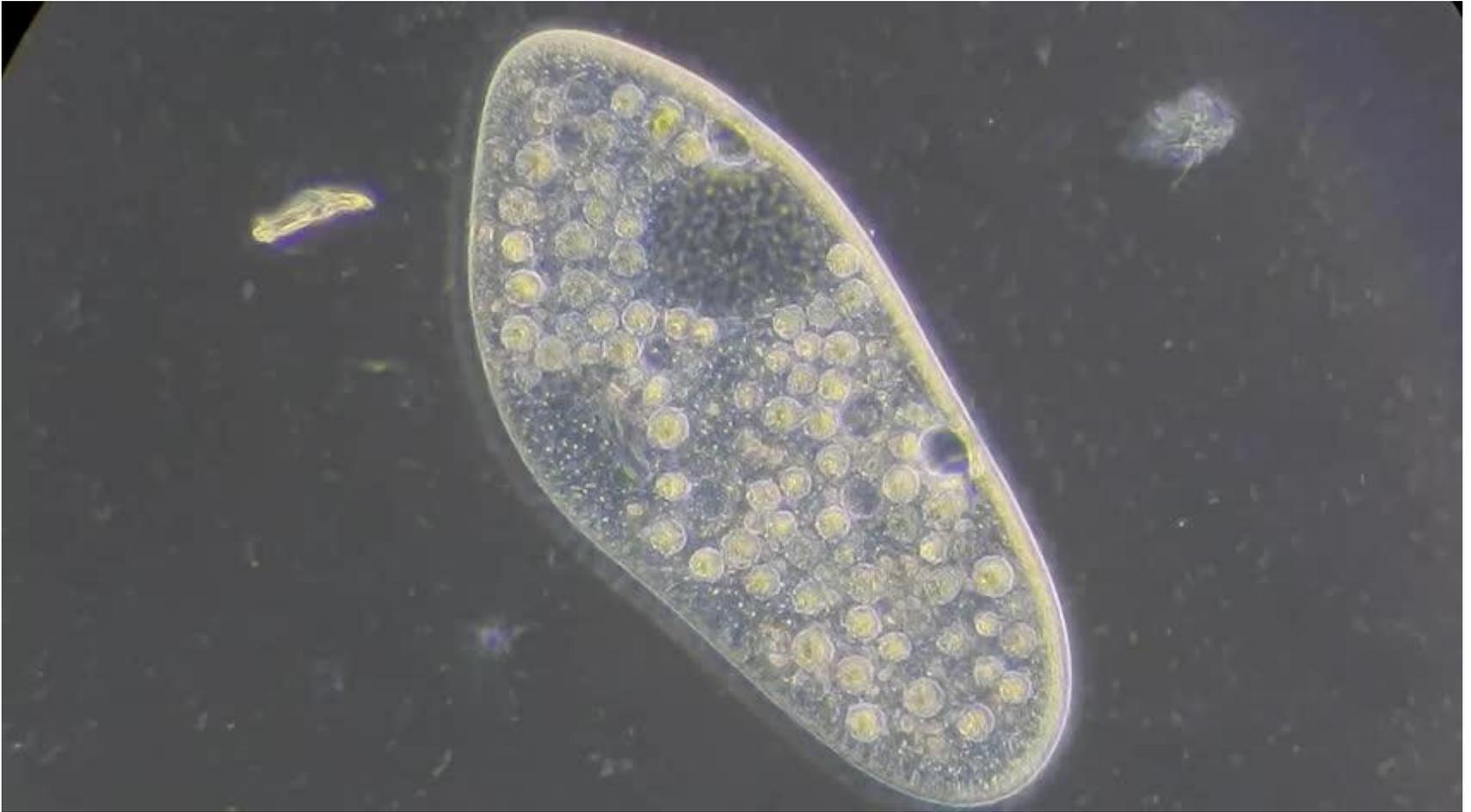
# Prokaryote - cyanobacterium



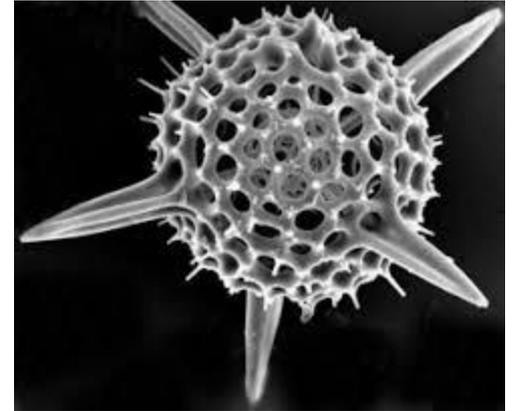
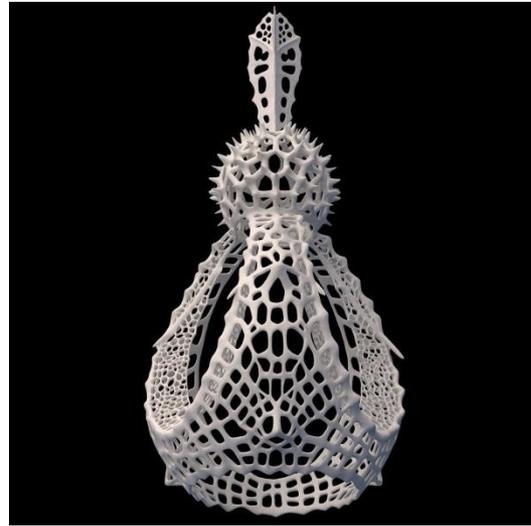
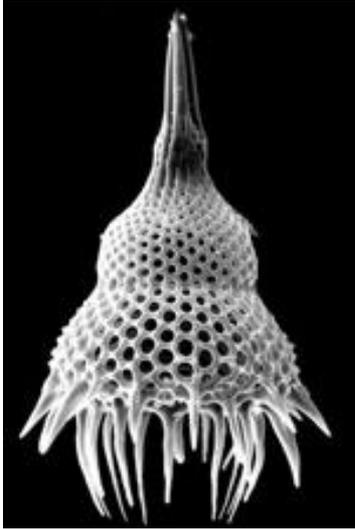
# Eucaryote - amoeba



# Eucariote - infusorium

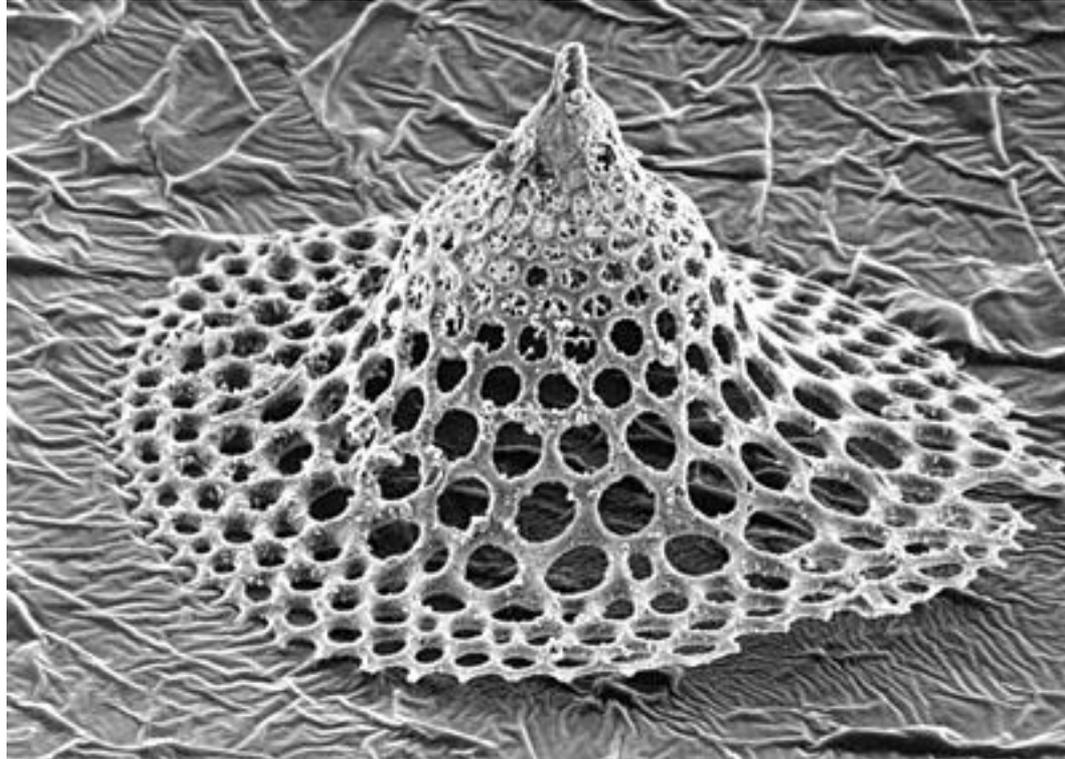


# Eucariote - radiolaria



# Fossil radiolarian

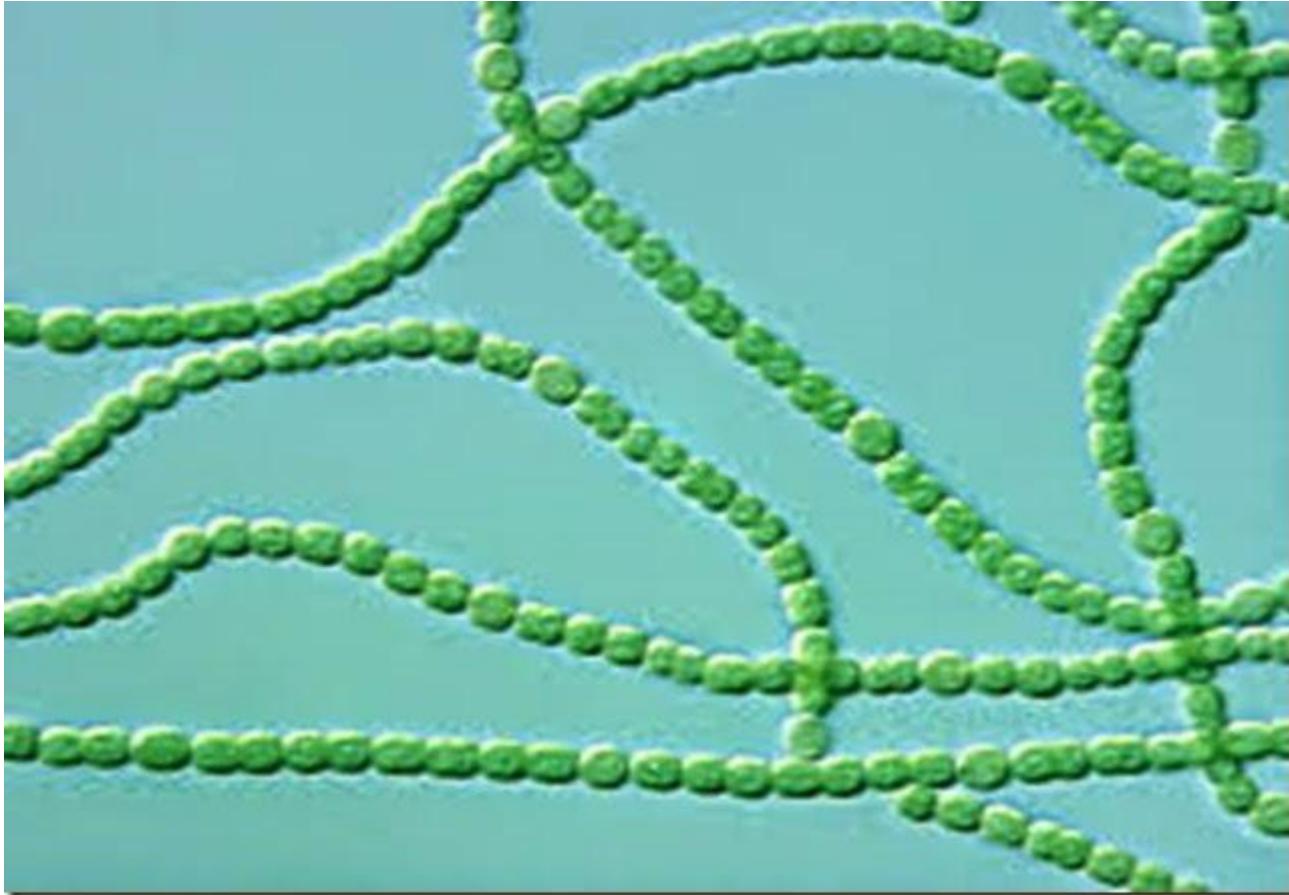
(over 70 million years old)



# Multicellular organisms

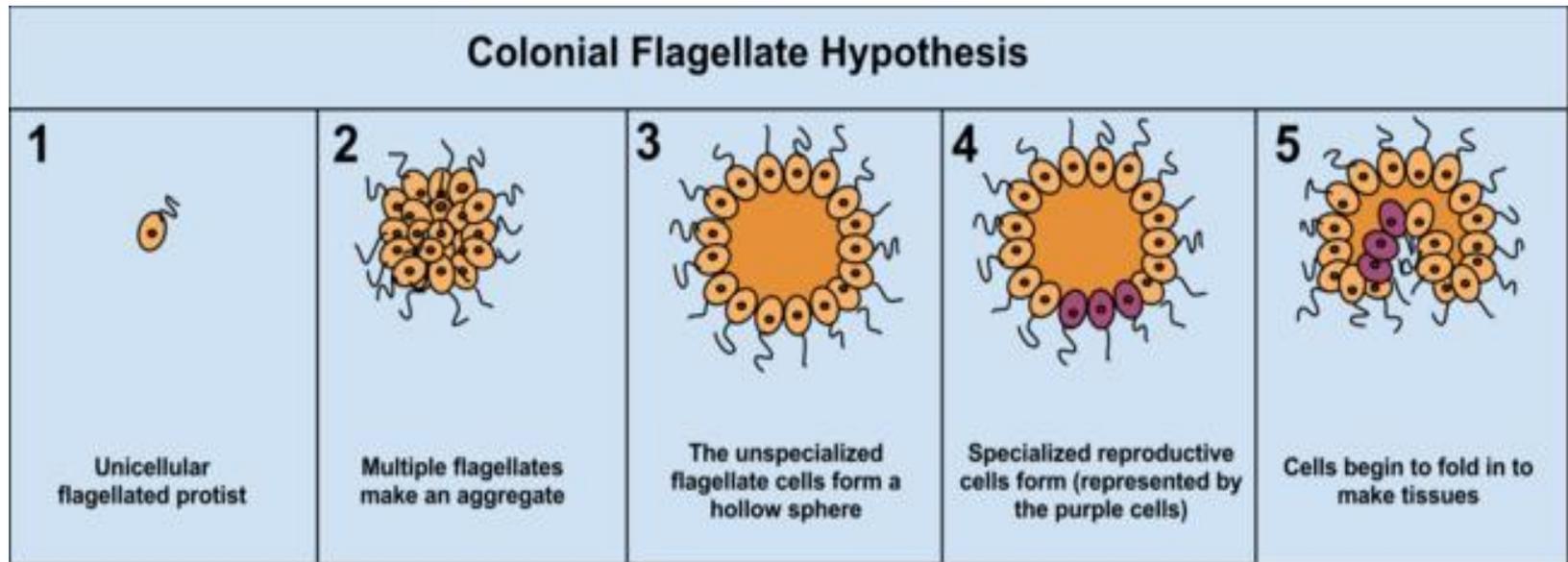
- Multicellular organisms are organisms that consist of more than one cell, in contrast to unicellular organisms.
- All species of animals, land plants and most fungi are multicellular.
- Multicellular organisms arise in various different ways, for example by cell division or by aggregation of many single cells. Colonial organisms are the result of many identical individuals joining together to form a colony.
- Multicellularity has evolved independently at least 46 times, including in some prokaryotes. Animals have evolved a considerable diversity of cell types in a multicellular body (100–150 different cell types), compared with 10–20 in plants and fungi.

# Chains of cyanobacteria

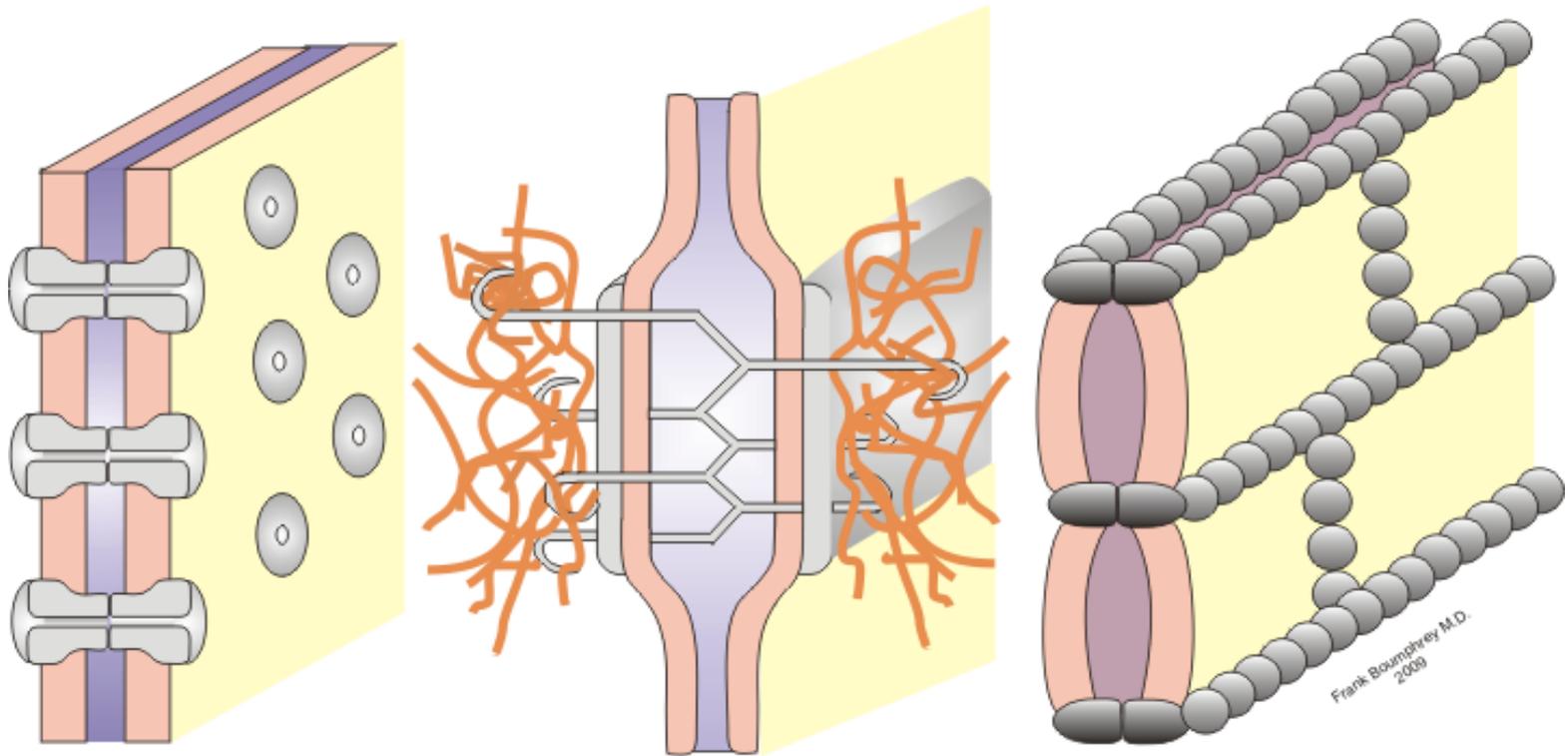


# The Colonial Theory

The Colonial Theory of Haeckel, 1874, proposes that the symbiosis of many organisms of the same species led to a multicellular organism.



# In a complex multicellular organisms cells adhere to each other and interact to form tissues



Gap Junction

Desmosome

Tight Junction

Frank Boumphrey M.D.  
2009

# Cell adhesion

- **Tight junctions** are multi-protein complexes that hold cells of a same tissue together and prevent movement of water and water-soluble molecules between cells.
- **Gap junctions** are the main site of cell-cell signaling or communication that allow small molecules to diffuse between adjacent cells.
- **Anchoring junctions:** adherens junctions and desmosomes. They provide strength and durability to cells and tissues.

# Cell signaling

Cell signaling allows cells to communicate with adjacent cells, nearby cells (paracrine) and even distant cells (endocrine). Receptor proteins on the cell surface have the ability to bind specific signaling molecules secreted by other cells. This binding induces a conformational change in the receptor which, in turn, elicits a response in the corresponding cell.

# Cancer

Multicellular organisms, especially long-living animals, face the challenge of cancer, which occurs when cells fail to regulate their growth within the normal program of development. Changes in tissue morphology can be observed during this process. Cancer in animals has often been described as a loss of multicellularity. Cancer can result from the loss of cell-cell interaction. In normal cells, growth is controlled by contact inhibition in which contact with neighboring cells causes a stunt in cell growth.