

Kingdom Protista

- ❖ Protists are **eukaryotes**; consequently they are much more complex than the prokaryotes (*bacteria*).
- ❖ The first eukaryotes to inhabit earth were **unicellular**.
 - ❖ These primal unicellular eukaryotes were not only the predecessors to the great variety of modern protists, but also to **all other eukaryotes** - plants, fungi, and animals.
 - ❖ The evolution of the protist marked the origin of the eukaryotic cell and the emergence of multi-cellular organisms.

Protists have been split into numerous kingdoms

- ❖ In the five-kingdom system of classification, eukaryotic organisms were divided among four kingdoms: **Protista, Fungi, Plantae, and Animalia**.
 - ❖ Kingdoms Fungi, Plantae, and Animalia have endured the taxonomic remodeling so far, however their boundaries have been expanded to include certain groups formerly classified as protists.
- ❖ Protista was defined partly by ***structural level*** (mostly unicellular eukaryotes) and partly by ***exclusion*** from the definitions of plants, fungi, or animals – a sort of “catch-all” kingdom.
 - ❖ However, this created a group ranging from single-celled microscopic members, simple multicellular forms, and complex giants like seaweeds.
- ❖ The kingdom Protista formed a **paraphyletic group**, with some members more closely related to animals, plants, or fungi than to other protists.
- ❖ Systematists have split the former kingdom Protista into as many as 20 separate kingdoms.
- ❖ Still, “protist” is used as an informal term for this great diversity of eukaryotic kingdoms.

When it comes to eukaryotic diversity, Protists win---hands down!

- ❖ Protists are so diverse that few general characteristics can be listed without exceptions.
- ❖ Most of the 60,000 known protists are unicellular, but some are colonial and others are multicellular.
- ❖ While unicellular protists would seem to be the simplest eukaryotic organisms, at the cellular level they are the ***most elaborate*** of all cells.
 - ❖ Remember...a single-celled organism **must** perform all of the basic functions performed by the groups of specialized cells in plants and animals.

Nutritional Requirements of Protists

- ❖ Protists are the most nutritionally diverse of all eukaryotes
 - ❖ Most protists are **aerobic**, with mitochondria for cellular respiration.
 - ❖ Some protists are **photoautotrophs** with chloroplasts.
 - ❖ Still others are **heterotrophs** that absorb organic molecules or ingest larger food particles.
 - ❖ A few are **mixotrophs**, combining photosynthesis and heterotrophic nutrition.

- ❖ These various modes of nutrition are scattered throughout the protists.
- ❖ While nutrition is not a reliable taxonomic characteristic, it *is* useful in understanding the adaptations of protists and the roles that they play in biological communities.
- ❖ Protists can be divided into three ecological categories:
 - **protozoa** - ingestive, animal-like protists, are heterotrophs
 - **absorptive** - fungus-like protists, are also heterotrophs
 - **algae** - photosynthetic, plant-like protists, are photoautotrophs.

Protist Motility

- ❖ Most protists move with flagella or cilia during some time in their life cycles.
- ❖ The eukaryotic flagella are ***not homologous*** to those of prokaryotes.
 - The eukaryotic flagella are extensions of the cytoplasm with a support of the 9 + 2 microtubule system.
 - Cilia are shorter and more numerous than flagella.
 - Cilia and flagella move the cell with rhythmic power strokes, analogous to the oars of a boat.

Protist Reproduction and Life Cycles

- ❖ Reproduction and life cycles are highly varied among protists.
- ❖ Mitosis occurs in almost all protists.
- ❖ Some protists are exclusively asexual (*genetically speaking, what does asexual mean?*).
- ❖ Others have a sexual cycle where they use meiosis and syngamy (the union of two gametes), to shuffle genes between two individuals. These individuals then go on to reproduce asexually.
- ❖ Many protists form resistant cells (**cysts**) that can survive harsh conditions (*what does this remind you of in prokaryotes—formation of what?*).

Protistan Habitats

- ❖ Protists are found almost anywhere there is water.
 - ❖ This includes oceans, ponds, and lakes, but also damp soil, leaf litter, and other moist terrestrial habitats.
 - ❖ In aquatic habitats, protists may be bottom-dwellers attached to rocks and other anchorages, or they may be motile, creeping through sand and silt.
 - ❖ Protists are also important parts of the **plankton**, the communities of organisms that drift passively or swim weakly in the water.
 - ❖ **Phytoplankton** (planktonic eukaryotic algae and prokaryotic cyanobacteria) are the basis of most marine and freshwater food webs.
- ❖ Many protists are symbionts that inhabit the body fluids, tissues, or cells of hosts.
- ❖ These symbiotic relationships run from mutualism to parasitism.
 - ❖ Some parasitic protists are important pathogens of animals, including those that cause potentially fatal diseases in humans (such as malaria).