

## Types of Evolution

- Monophyletic: An organism is grouped with all of its descendants
  - Mammals
- Paraphyletic: An organism is grouped with some of its descendants
  - Fish
- Polyphyletic: A group of organisms don't share a common ancestor

## Protists → Eukaryotic (Membrane bound organelles)

- Any organism that is not a plant, animal or fungus
- Mostly unicellular / lacking specialized tissue if multicellular
- Paraphyletic → Original/historical classifications of life based on observable characteristics (behavior, appearance)
  - DNA sequencing reclassified based on genetics
- Many are relevant
  - Parasites: Giardia, Trychomonas, Trypanosoma
  - Termites, enzyme producing, motility for protists
  - Algae
    - Oxygen production - photosynthetic
      - 70-80% of world's oxygen produced by algae
    - Biofuels - oil in algae to produce fuel
      - Consumes CO<sub>2</sub> from environment
      - Waste for fertilizer/feedstock

- Kingdom Alveolata - Monophyletic, characterized by alveolae
  - Dinoflagellates → 2 unequal flagella
    - Unicellular, aquatic, complex membranes
    - Can be photosynthetic, mixotrophic or heterotrophic
    - 90% marine plankton
    - Bioluminescence - light produced from biological pathways (scintillons)
      - Burglar hypothesis
    - Coral reefs - mutualistic
      - Provide products of photosynthesis, mediate nutrient transfer and enhance calcification
      - Receive protection and CO<sub>2</sub>
      - Reefs are actually white, algae give color
        - Bleaching results from loss of algae or loss of photosynthetic pigments
        - Storms, water temperature change, acid
      - Reefs are billion dollar industry
      - Few dinoflagellates produce neurotoxins
        - Defensive and offensive
        - Algal blooms can result
          - Increasing frequency and intensity
          - Cause dead zones (No O<sub>2</sub>)
    - Neurotoxins: Saxitoxins, Brevetoxins, Ciguatoxins
  - Apicomplexans → Infect cells using apical complex

- Cluster of microtubules at apex
- Complicated lifecycles with many hosts
- Plasmodium (Malaria)
  - Steril Insect Technique, Genetically Engineer
- Taxoplasma Gondii - Intestine of cats
  - Can infect any warm-blooded creature
  - Estimated 50% of world is infected
  - Requires intermediate host (Rats/Mice)
  - Delayed reaction time of infected??
  - Linked to Schizophrenia
- Kingdom Stramenopila - Characterized by hair-like projections
  - o Stramen = flagellum, Pilos = hair
  - o Diatoms - Most abundant photosynthetic organism in oceans
    - Lack flagella, non-motile
    - Inorganic cell wall made largely of silica
    - Very sensitive to water chemistry
    - Pest control, filtration, abrasion, absorption, agriculture
  - o Golden Algae - Mostly freshwater
    - Mixotrophic
    - Prey using pseudopodia (actin)
    - Produce toxins to gill-breathing fish