K. T. S. P. Mandal's
Hutatma Rajguru Mahavidyalaya
Rajgurunagar 410 505.
Department of Zoology

F. Y. B. Sc.
ZO 111: Animal Diversity I

Semester I

By
Prof. D. N. Birhade.

Principles of classification

TAXONOMY

ARRANGEMENTS BY RULES

Introduction

- Taxonomy is the branch of biology that deals with the identification, nomenclature & classification of organisms
- IDENTIFICATION – placing of new organism in previously described group
- NOMENCLATURE – naming of organism
- CLASSIFICATION – ordering of organism into group; can be phenetic or phylogenetic

Systematics

- Organizing the taxonomic information about the organism into a logical classification that provides the framework for all comparative studies
- study of biological diversity and evolutionary history
- Systematics + taxonomy = systematic biology

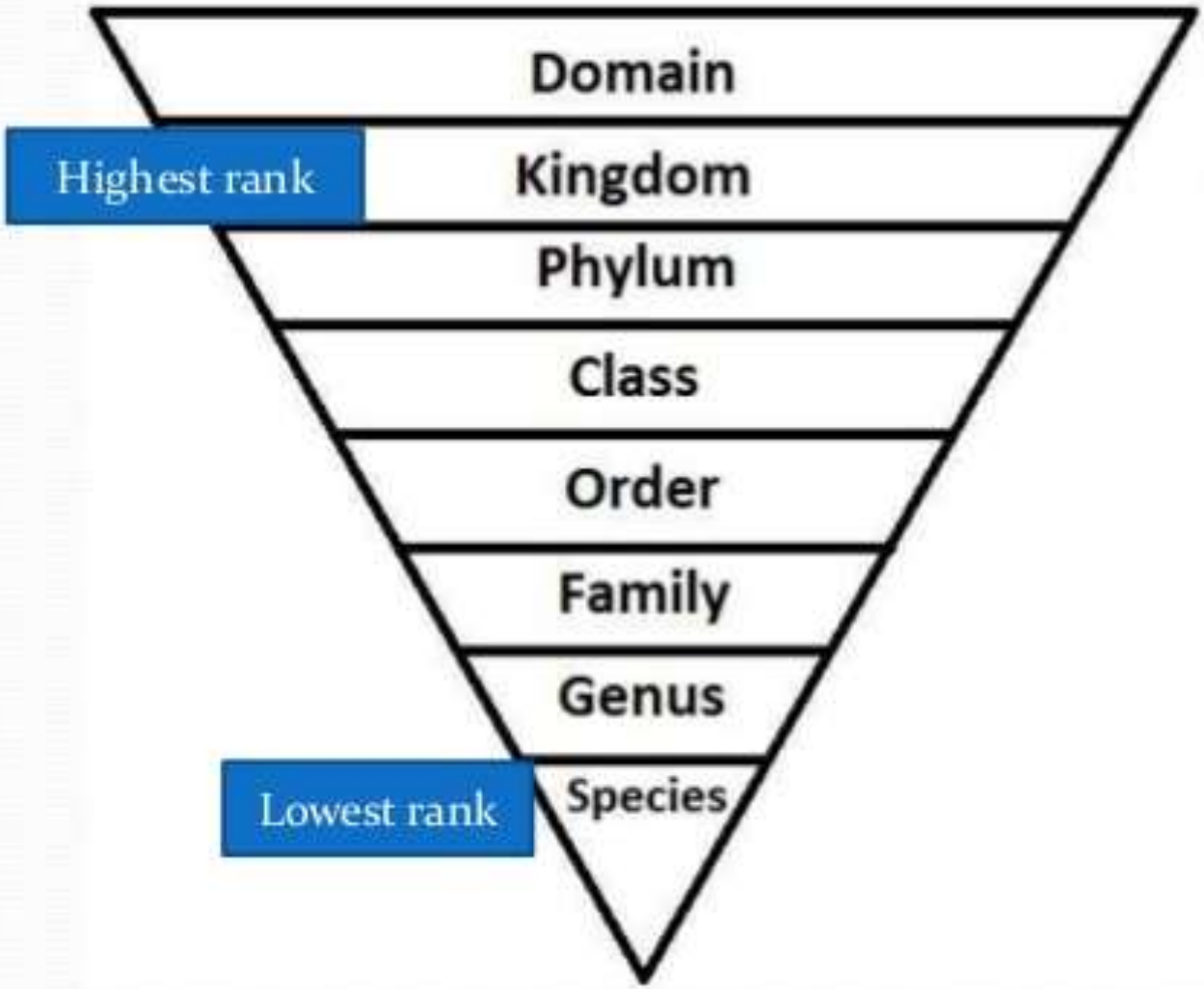
Levels of taxonomy

- ALPHA TAXONOMY – includes species description, taxonomic keys, diagnoses
- BETA TAXONOMY – includes identification of natural groups and biological classes
- GAMMA TAXONOMY – includes study of evolutionary processes and patterns

- Organisms – first classified – ARISTOTLE (2000 yrs ago) – as plants and animals
- Modern biological classification – C. LINNAEUS - developed hierarchy (a ranking system)

  - basis of modern taxonomy
- A **hierarchical system** is used for classifying organisms to the species level.

Levels of classification



Dumb
King
Phillip
Came
Over
For
Gooseberry
Soup!

- Kingdom is the largest unit of classification
- Together they make up taxanomic hierarchy
- Named grouped within hierarhcy is called TAXA (single : taxon)
- As one processes down the hierarchy, the number of organism in each taxon decreases and similarities between them increases
- **Lower the taxa, more are the characteristics that the members within the taxon share.** (The number of similar characters of categories decreases from lowest rank to highest rank.)

Species

- Species (used both as singular and plural) is a natural population of individuals or group of population which resemble one another in all essential morphological and also reproductive characters so that they are able to interbreed freely and produce fertile offspring.
- Mango is species indica of genus mangifera (mangifera indica). Potato is species tuberosum of genus solanum (solanum tuberosum).

Genus

- it is a group or assemblage of relate species which resemble one another in certain correlated characters.
- **Correlated Characters** are those similar or common features which are used in delimitation of a taxon above the rank of species.
- All the species of genus are presumed to have evolved from a common ancestor.

Family

- it is taxonomic category which contains one or more related genera.
- All the genera of a family have some common features or correlated characters.
- They are separable from genera of a related family by important and characteristic differences in both vegetative and reproductive features.
- Thus the genera of cats (felis) and leopard (panther) are included in the family **felidae.**

Order

- the category includes one or more related families.
- Thus the family solanaceae is placed in the order **polemoniales** along with four other related families (convolvulaceae, boraginaceae, hydrophyllaceae and polemoniaceae).
- Similarly, the families fekidae and canidae are included under the order **carnivore** alongwith hyaenidae (hyaenas) and ursidae (bears).

Class

- a class is made of one or more relates order.
- For example, class **dicotyledoneae** (dicotyledonae, dictoyledons) of flowering plants contains all dicots which are grouped into several orders (e,g. Rosales, passiflorales, polemoniales, sapindales, ranales, etc.) likewise, class **mammalian** of animals includes all mammals which range from bats (order chiroptera),kangaroos (order marsupialia).
- Rodents (order rodentia), whales (order cetacean), carnivores (order cornivora) to great apes and man (order primate).

Division or phylum

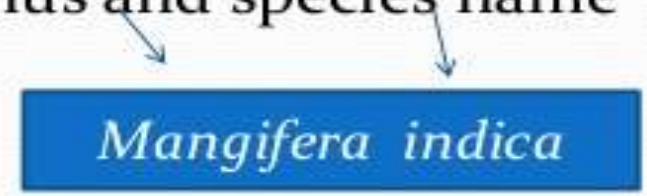
- it is a category higher than that of class.
- The term phylum is used for animals while division is commonly employed for plants.
- A division or phylum is formed of one or more classes.
- The phylum **chordate** of animals contains not class mammalian but also aves (birds), reptilian (reptiles), amphibian (amphibians), cyclostomata, chondrichthyes, osteichthyes (fishes) etc.

Kingdom

- it is the highest taxonomic category. All plants are included in kingdom plantae while all animals belong to kingdom animalia.

Binomial nomenclature

- Linnaeus
- Inculde – genus and species name



- The binomial scientific name in which name of the genus and that of the species is similar

  - TAUTONYM

Biological species concept

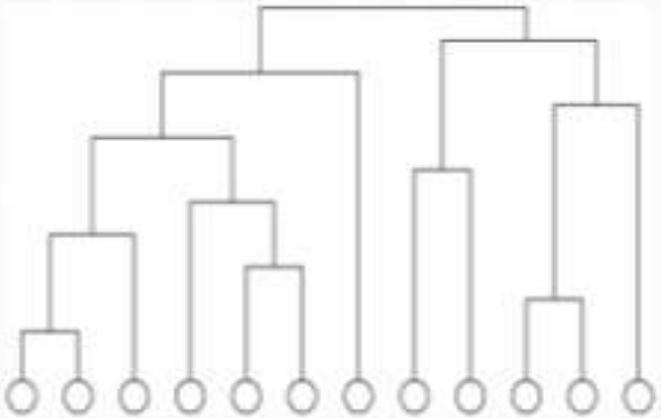
- Ernst mayr – "*species are groups of interbreeding natural population that are reproductively isolated from other such groups*"
- Two organisms breed within the species – gene are passed to offspring – process is repeated – gene are constantly shuffled around the species gene pool – this shared gene pool gives species its identity
- Cryptic species – two species very similar morphologically but reproductively isolated

Subspecies

- Taxonomic subdivision of species – by phenotypic characters, origin or geographical region
- Allopatric
- Race is different from subspecies – used only in case of human
- Species with uniform population – monotypic and if divided into two or more subspecies – polytypic
- Species population with no genetic variation – monomorphic and if two or more genetic variation for particular gene – polymorphic

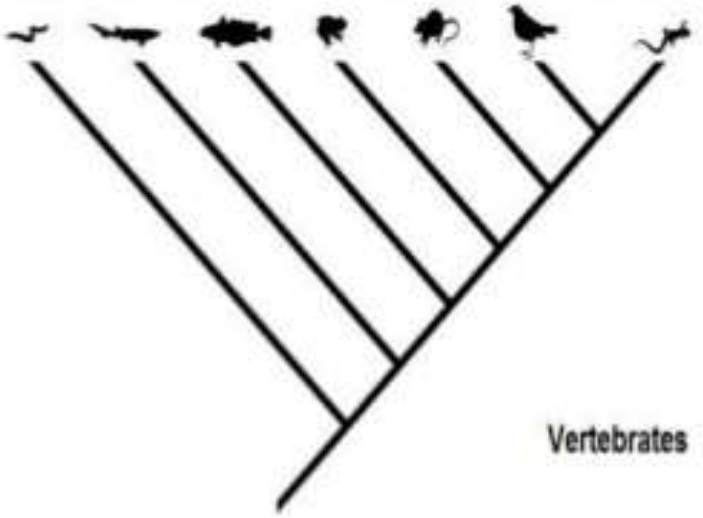
Numerical taxonomy

- Classified based on numerous characteristics
- Total number of characters they have in common
- Characteristics may be – phisiological, morphological, biochemical, behavioural
- Such classification is called phenetic classification
- Various groups are linked together according to the degree of similarity between them – this gives tree like diagram called DENDROGRAM



Phylogenetic Systematics

- Classification based on ancestry
- Know as cladistics or phylogenetic analysis
- Most widely used method
- Clades – defined by possession of unique features (groups with the shared features)
- A CLADOGRAM is used by a scientist studying phylogenetic systematics to visualize the groups of organisms being compared, how they are related, and their most common ancestors




Five Kingdom
Classification
www.fppt.info

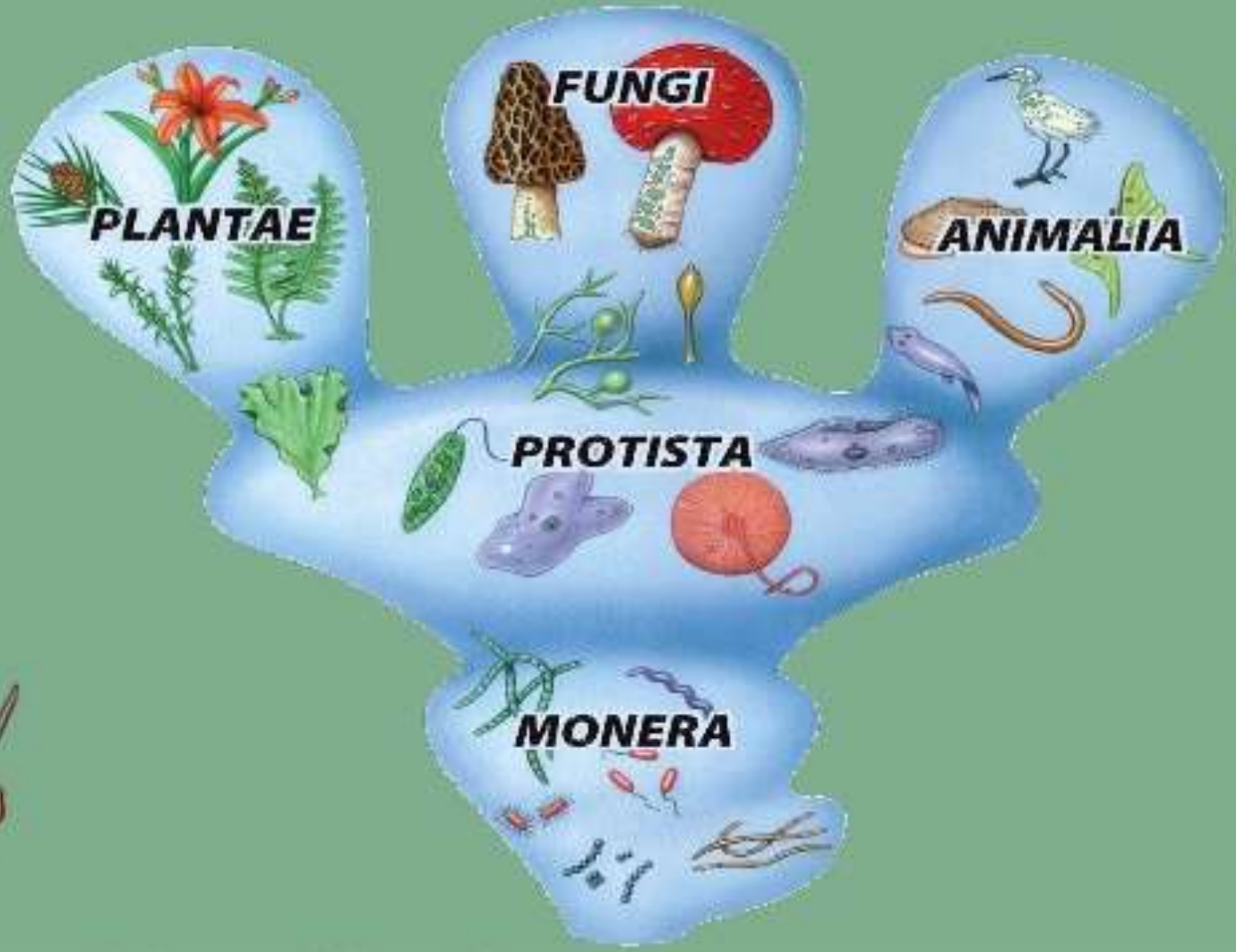
- In 1937, E-Chatton suggested the terms of, "**Procariotique**" to describe bacteria and "**Eucariotique**" to describe animal and plant cells.

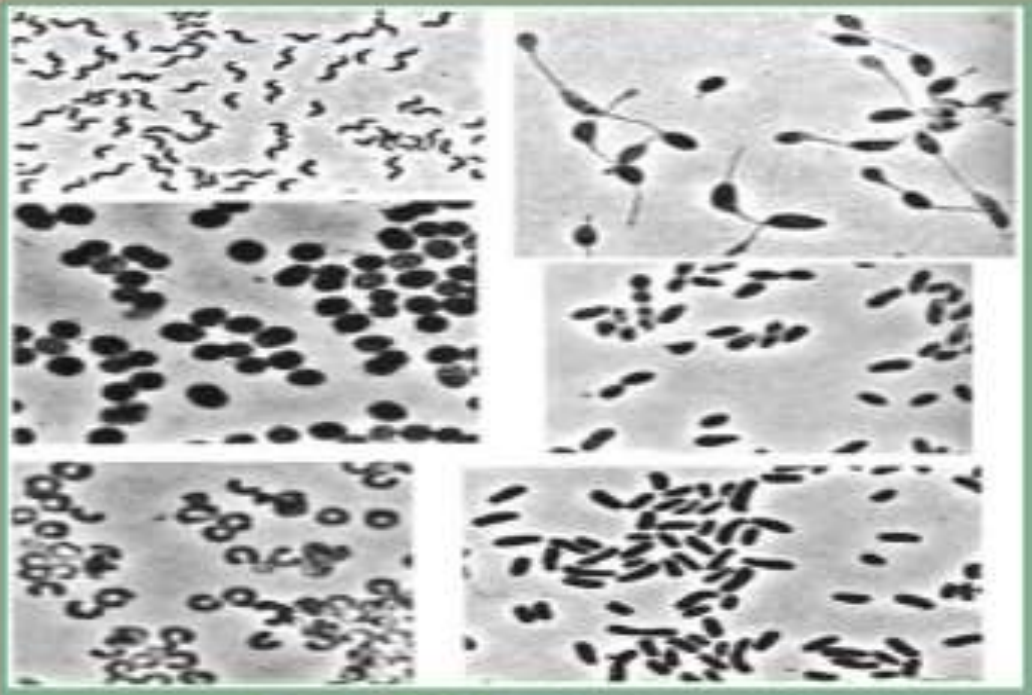
- 1967, Robert Whittaker introduced the five-kingdom classification system.

Basis of Five Kindom System

- The levels of cellular organization:
  > prokaryotic
  > unicellular eukaryotic
  > multicellular eukaryotic
- The principal modes of nutrition
  > photosynthesis
  > absorption
  >ingestion

Five Kingdoms

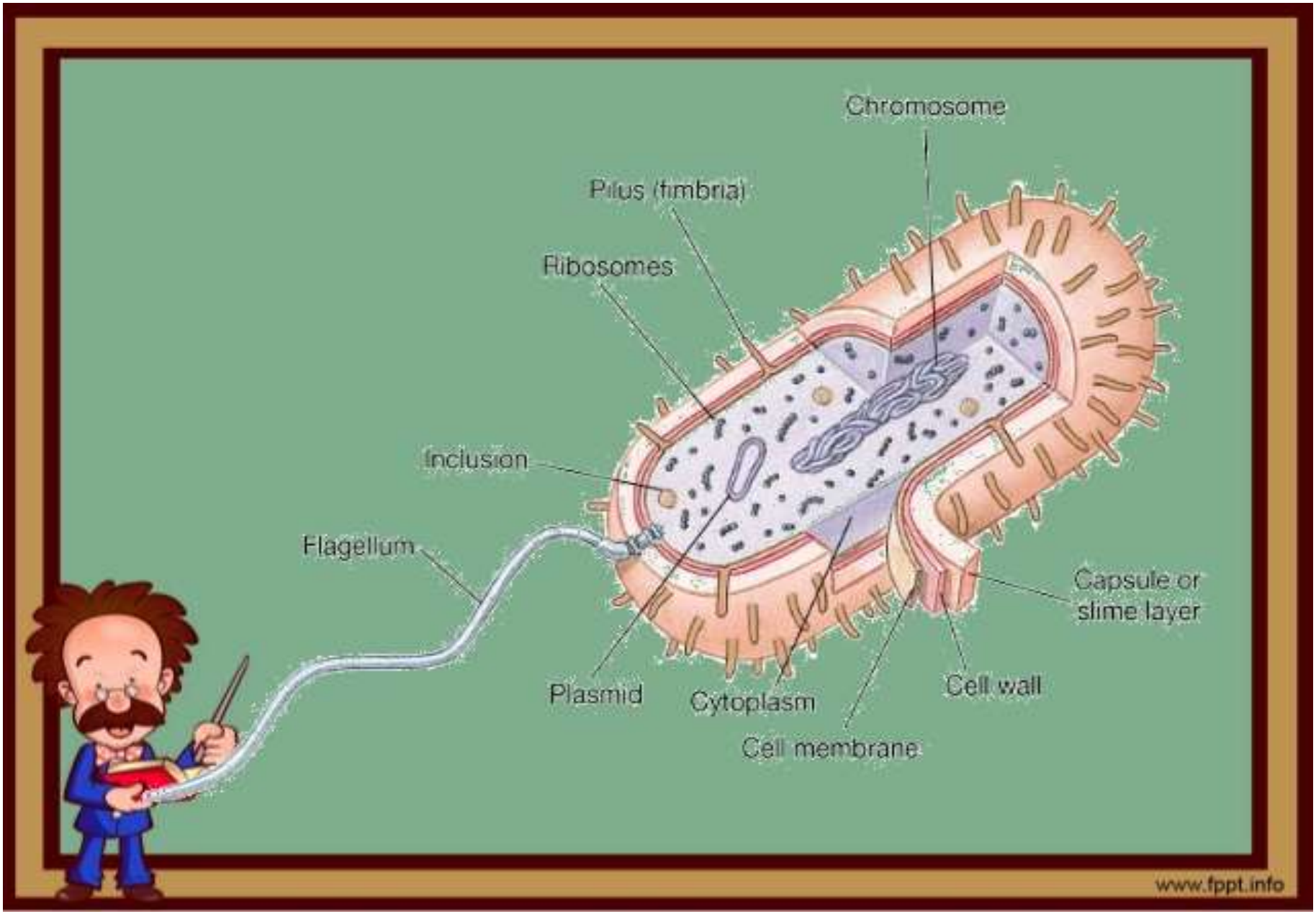




Kingdom Monera

Characteristics

- It includes prokaryotic organisms
- Monerans are unicellular
- Most are heterotrophic but some perform photosynthesis
- two different kinds of organisms i.e.bacteria and cyanobacteria.


Chromosome
Pilus (fimbria)
Ribosomes
Inclusion
Flagellum
Capsule or slime layer
Plasmid
Cytoplasm
Cell wall
Cell membrane
www.fppt.info

There are two subkingdoms of Kingdom Monera:

- Archaebacteria-can live in the most extreme of environments.
- Eubacteria-Is also called the true bacteria

Kingdom protista

Characteristics

- It includes eukaryotic unicellular and simple multicellular organisms
- There are three main types of protists.
  1) Algae
  2) Protozoans
  3) Fungi like protists

Characteristics

- It includes eukaryotic multicellular heterotrophs which are absorptive in their nutritional mode e.g. mushrooms.
- Most fungi are decomposers.
- They live on organic material, secrete digestive enzymes and absorb small organic molecules formed by the digestion by enzymes.

Kingdom Plantae

Characteristics

- It includes eukaryotic multicellular autotrophs.
- Plants are autotrophic in nutritional mode, making their own food by photosynthesis.
- They have multicellular sex organs and form embryos during their life cycles.
- Examples: Mosses, ferns and flowering plants are included in this kingdom.

KINGDOM ANIMALIA

Characteristics

- It includes eukaryotic multicellular consumers.
- Animals live mostly by ingesting food and digesting it within specialized cavities.
- They lackcell wall and show movements.

Table 3.2: Distinguishing characteristics of the five kingdoms of life

Kingdom	Cell Type	Nuclear Envelope	Cell Wall	Mode of Nutrition	Multi-Cellularity
Monera	Prokaryotic	Absent	Non-cellulose (polysaccharide plus amino acids)	Autotroph or heterotroph	Absent
Protista	Eukaryotic	Present	Present in some forms, various types	Photosynthetic or heterotroph, or combination	Absent in most forms
Fungi	Eukaryotic	Present	Chitin	Absorptive heterotroph	Present in most forms
Plantae	Eukaryotic	Present	Cellulose and other polysaccharides	Photosynthetic	Present in all forms
Animalia	Eukaryotic	Present	Absent	Ingestive heterotroph	Present


Thank
you