- *Definition & Benefit of Classification*
- Classification System
- Classification of Organisms
- Conclusion

Species of Organisms

- There are **13 billions** known species of organisms
- This is **only 5%** of all organisms that ever lived
- **New organisms** are still being found and identified

What is Classification

- Classification is the arrangement of organisms into orderly **groups** based on their **similarities**
- Classification is also known as **Taxonomy**
- Taxonomists are scientists that identify and name organisms

Benefits of Classifying

- **Accurately** & **uniformly** names organisms
- **Prevents misnomers** such as starfish and jellyfish that aren't really fish
- Other example : sea horse isn't really horse
- Uses same language (Latin or some Greek) for all names

Confusion in Using Different Language for Names

Latin Names are Understood by All Taxonomists

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Early Taxonomists

- 2000 years ago, **Aristoteles** was the first taxonomist
- Aristoteles divided organisms into **plants** and **animals**
- He subdivided them by their habitat (land, sea, or air dwellers)

Early Taxonomists

- **John Ray**, a botanist, was the first to use Latin for naming
- His names were very long descriptions telling everything about the plant

Carolus Linnaeus 1707-1778

- 18th century taxonomist
- Classified organisms by their structure
- Developed naming system still used today

TAXONOMY

- Developed the modern system of naming known as **binomial nomenclature**
- **Two word** name (**Genus** and **Species**)

Standardized Naming

Binomial nomenclature used :

- *Genus species*
- Latin or Greek
- Italicized in print
- Capitalize genus, but not species
- Underline when writing

Standardized Naming

Example : Giant Panda (*Ailuropoda melanoleuca*), Polar bear (*Ursus maritimus*), Grizzly bear (*Ursus arctos*)

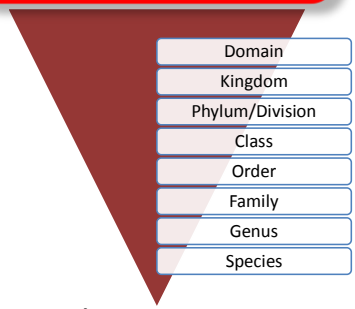
Rules for Naming Organisms

- **The International Code** for Binomial Nomenclature contains the rules for naming organisms
- All names must be **approved** by **International Naming Congresses** (ex : International Zoological Congress)
- This system prevent duplicated names

Classification of Groups

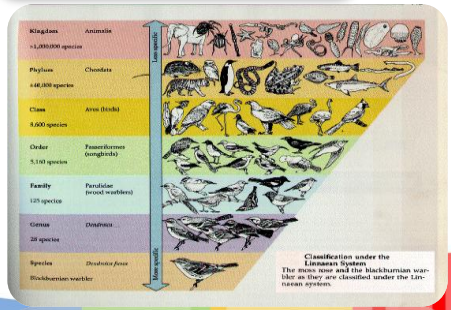
- Taxon (taxa-plural) is a category into which related organisms are placed
- There is a hierarchy of groups (taxa) from broadest to most specific

Hierarchy of groups (taxa)



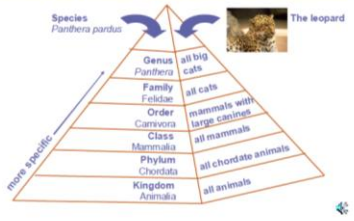
- Phylum → Division-used for plants

Classification of Groups



Classification of Groups

Linnaean System: Hierarchical Classification



Classification Level	Common Name	Kingdom	Phylum	Class	Order	Family	Genus	Species
	Human (?)	Animalia	Chordata	Mammalia	Primate	Hominidae	*Homo*	*sapiens*
	Canada goose	Animalia	Chordata	Aves	Anseriformes	Anatidae	*Branta*	*canadensis*
	Lake darner	Animalia	Arthropoda	Insecta	Odonata	Aeshnidae	*Aeshna*	*eremita*
	Mosquito	Animalia	Arthropoda	Insecta	Diptera	Culicidae	*Aedes*	*fitchii*

Classification of Human

Table 1.1 Classification of Humans

Classification Category	Characteristics
Domain Eukarya	Cells with nuclei
Kingdom Animalia	Multicellular, motile, ingestion of food
Phylum Chordata	Dorsal supporting rod and nerve cord
Class Mammalia	Hair, mammary glands
Order Primates	Adapted to climb trees
Family Hominidae	Adapted to walk erect
Genus *Homo*	Large brain, tool use
Species *Homo sapiens**	Body proportions of modern humans

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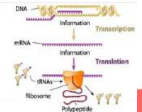
Data Used in Classification

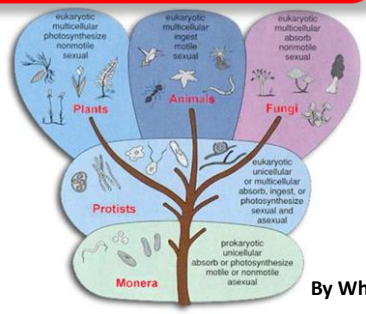
- Classification of organisms is largely based on
  - morphology
  - anatomy / development
  - the fossil record
  - molecular data



Classification of Organisms

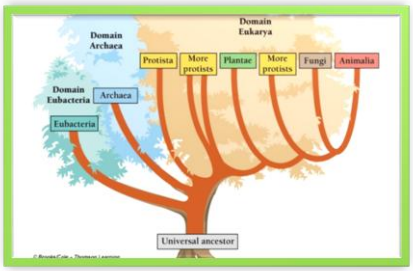
Linnaeus 1735	Haeckel 1866[4]	Chatton 1937[5]	Copeland 1956[6]	Whittaker 1969[7]	Woese et al. 1977[8]	Woese et al. 1990[9]
2 kingdoms	3 kingdoms	2 empires	4 kingdoms	5 kingdoms	6 kingdoms	3 domains
(not treated)	Protista	Prokaryota	Monera	Monera	Eubacteria	Bacteria
					Archaebacteria	Archaea
Vegetabilia	Plantae	Eukaryota	Protista	Protista	Protista	Eukarya
				Fungi	Fungi	
			Plantae	Plantae	Plantae	
Animalia	Animalia		Animalia	Animalia	Animalia	

Classification based on 5 Kingdoms



By Whittaker

Classification based on Domain



DOMAINS (Woose *et al*)

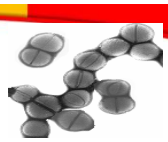
- Broadest, most inclusive taxon
- **Three domains**
- Archaea and Eubacteria are unicellular prokaryotes (no nucleus or membrane-bound organelles)
- Eukarya are more complex and have a nucleus and membrane-bound organelles

Eubacteria

- Eubacteria, some of which cause human diseases, are present in almost all habitats or earth

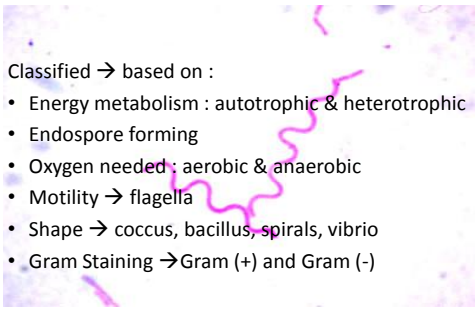
Bacteria

Bacteria



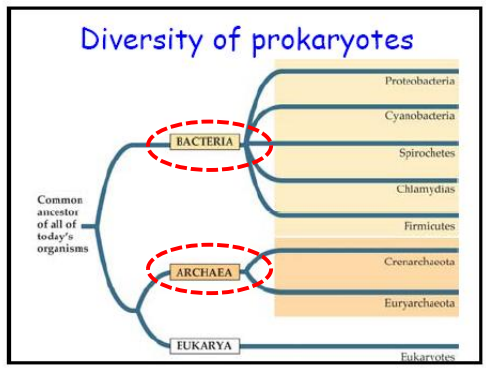
- Prokaryotes unicellular organism
- 0.5 -1 µm x 2–5 µm
- One molecule DNA without membrane (nucleolid)
- Ribosome contain only one type RNA polymerase

Bacteria Classification



Classified → based on :

- Energy metabolism : autotrophic & heterotrophic
- Endospore forming
- Oxygen needed : aerobic & anaerobic
- Motility → flagella
- Shape → coccus, bacillus, spirals, vibrio
- Gram Staining →Gram (+) and Gram (-)



Archaea

- Cell wall haven't consist of peptidoglycan
- Most live in extreme environments : temperature, pH, oxygen concentration or salinity
- Ribosome contain some type RNA polymerase
- Have distinctive lipids in their membranes
- **2 group** : ***Crenarchaeota & Euryarchaeota***

1. Crenarchaeota

- Most are **acidophil** and **thermopiles**
- H_2S as source of energy
- Life in hot sulfur springs, die of cold at 131°C ex. *Sulfolobus*

2. Euryarchaeota

1. **Some methanogens**,
   - produce CH_4 from CO_2
   - Responsible for 80-90% atmospheric methane
   - Ex. *Lachnospira multiparus, Ruminococcus albus*

2. **Some halophiles**
   - Pigment bacteriorhodopsin

Domain Eukarya is divided into Kingdoms

- Protista (protozoans, algae)
- Fungi (mushrooms, yeasts)
- Plantae (multicellular plants)
- Animalia (multicellular animals)

Protista

- Kingdom mikroorganisme eukariotik yg bukan hewan maupun tumbuhan.
- **Uniseluler** : Protozoa, euglena
- **Multiseluler** : jamur
- **Filum Protista (3)** :
  1. protista **mirip hewan** : Mastigophora, Sarcodina, Ciliophora, Sporozoa
  2. protista **mirip tumbuhan** : Euglena, Chrysophyta, Pyrophyta, Chorophyta, Phaephyta, Rhodophyta
  3. Protista **mirip jamur** : Mycomycota, Oomycota

Protista

Protista

Algae

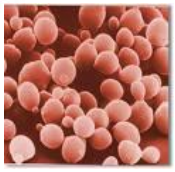
Protozoa

Fungi

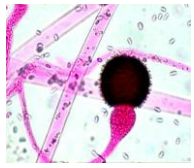
Karakteristik Fungi

- Uniselular (yeast / khamir / ragi)
- Multiselular : (molds / kapang) dan (mushroom / cendawan / club fungi)
- Hifa & miselium (multiseluler)
- Non motile, Non vascular, Heterotrof
- Most dekomposer (saprofit), some parasit
- Reproduksi → spora aseksual & seksual
- Organisme eukariot (punya membran inti)

Fungi

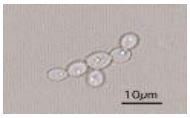


Yeast

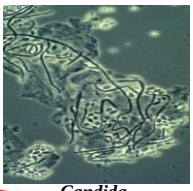


Molds

Yeast / Khamir



Saccharomyces



Candida

- Unicellular fungi
- P 1-50 µm x L 1-10 µm
- Budding , Binary fission, Budding Fission & sporulasi
- Slime Capsule

Molds / Kapang

- Filamentous Fungi
- Rapidly growth
- Sexual & Asexual Spores
- Ex. *Rhizopus, Mucor, Penicillium, Neurospora, Saprolegnia,* etc

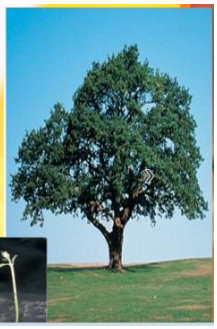
→Food spoilage
→Food products
→Antibiotics, etc.

Rhizopus pada Strawberry

Noble Rot - *Botrytis*

Plantae

- Multicellular
- Autotrophic
- Absorb sunlight to make glucose – Photosynthesis
- Cell walls made of cellulose



Animalia

- Multicellular
- Ingestive heterotrophs (consume food & digest it inside their bodies)
- Feed on plants or animals

Eukarya Summary

Kingdom	Organization	Type of Nutrition	Representative Organisms				
Protista	Complex single cell, some multicellular	Absorb, photo-synthesize, or ingest food	paramecium	euglenoid	slime mold	dino-flagellate	Protozoans, algae, water molds, and slime mold
Fungi	Some unicellular, most multicellular filamentous forms with specialized complex cells	Absorb food	black bread mold	yeast	mushroom	bracket fungus	Molds, yeast, and mushrooms

Eukarya Summary

Plantae	Multi-cellular form with specialized complex cells	Photo-synthesize food	moss	fern	pine tree	nonwoody flowering plant	Mosses, ferns, nonwoody and woody flowering plants
Animalia	Multi-cellular form with specialized complex cells	Ingest food	coral	earthworm	blue jay	squirrel	Invertebr-ates, fishes, reptiles, amphibians, birds, and mammals

How About Virus ?

Virus

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Te Ri Ma Ka Sih