Classification

Species of Organisms

- There are 13 billion 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 & name organisms

Benefits of Classifying

- Accurately & uniformly names organisms
- Prevents misnomers such as starfish & jellyfish that aren't really fish
- Uses same language (Latin or some Greek) for all names

Sea"horse"??

Confusion in Using Different Languages for Names

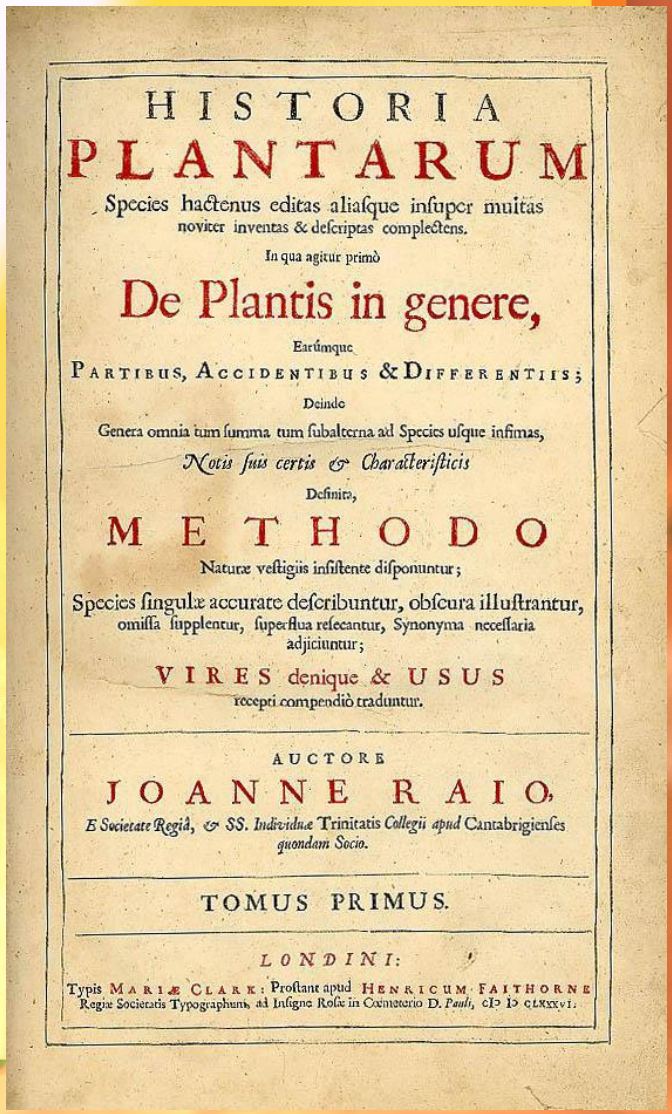
Latin Names are Understood by all Taxonomists

Early Taxonomists

- 2000 years ago, Aristotle was the first taxonomist
- Aristotle divided organisms into plants & 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

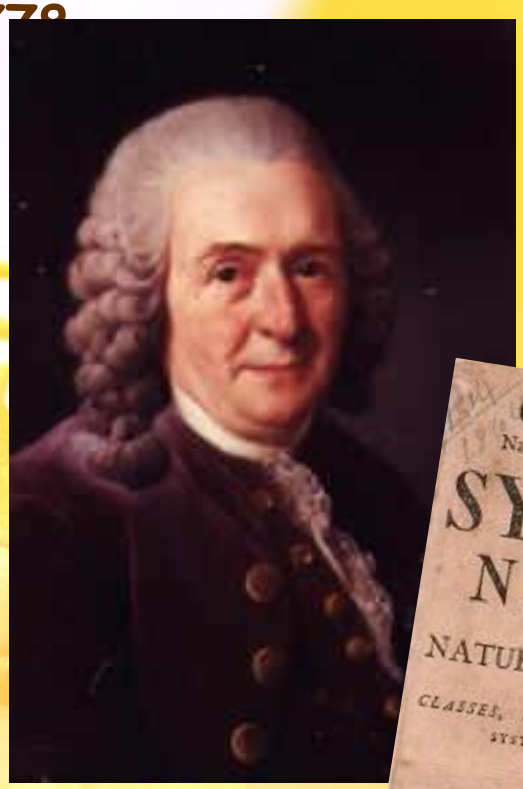


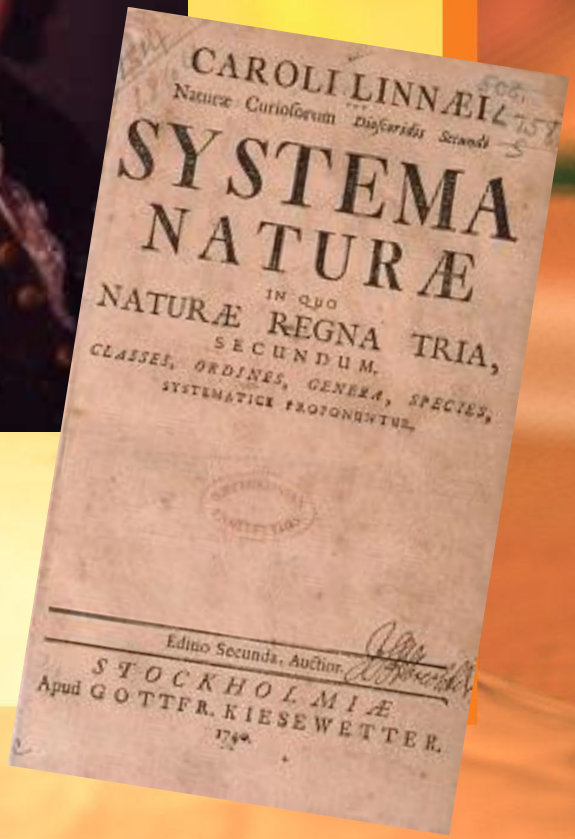
HISTORIA
PLANTARUM
Species hactenus editas aliasque insuper multas
noviter inventas & descriptas complectens.
In qua agitur primò
De Plantis in genere,
Earúmque
PARTIBUS, ACCIDENTIBUS & DIFFERENTIIS;
Deinde
Genera omnia tum summa tum subalterna ad Species usque infimas,
Notis suis certis & Characteristicis
Definita,
METHODO
Naturæ vestigiis insistente disponuntur;
Species singulæ accurate describuntur, obscura illustrantur,
omissa supplentur, superflua resecantur, Synonyma necessaria
adjiciuntur;
VIRES denique & USUS
recepti compendiò traduntur.
AUCTORE
JOANNE RAIO,
E Societate Regiâ, & SS. Individuæ Trinitatis *Collegii apud* Cantabrigienses
quondam Socio.
TOMUS PRIMUS.
LONDINI:
Typis MARIÆ CLARK: Prostant apud HENRICUM FAITHORNE
Regiæ Societatis Typographum, ad Insigne Rosæ in Cœmeterio D. *Pauli*, CIↃ IↃ CLXXXVI.

Carolus Linnaeus

1707 - 177?

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





Carolus Linnaeus

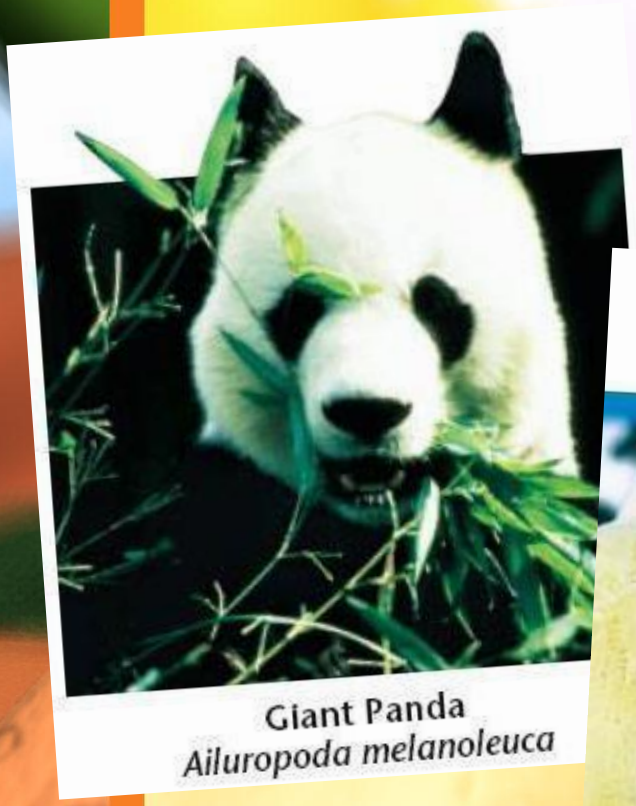
- Called the "Father of Taxonomy"
- Developed the modern system of naming known as binomial nomenclature
- Two-word name (Genus & species)

Standardized Naming

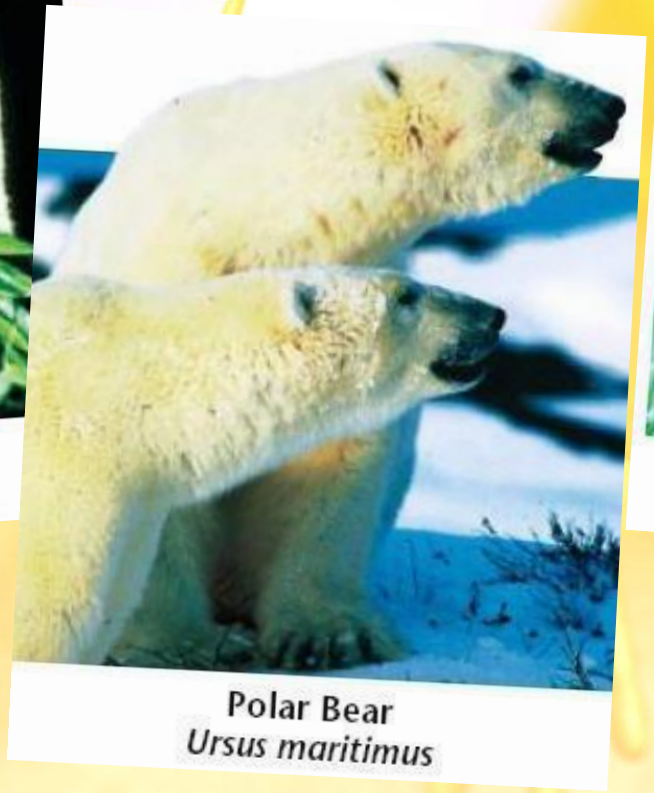
- Binomial nomenclature used
- *Genus species*
- Latin or Greek
- Italicized in print
- Capitalize *genus*, but NOT species
- Underline when writing

American Robin

Binomial Nomenclature



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 (International Zoological Congress)
- This prevents duplicated names

Classification 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
- Domain, Kingdom, Phylum, Class, Order, Family, *Genus, species*

Hierarchy-Taxonomic Groups

Domain ← BROADEST TAXON

Kingdom

Phylum (Division – used for plants)

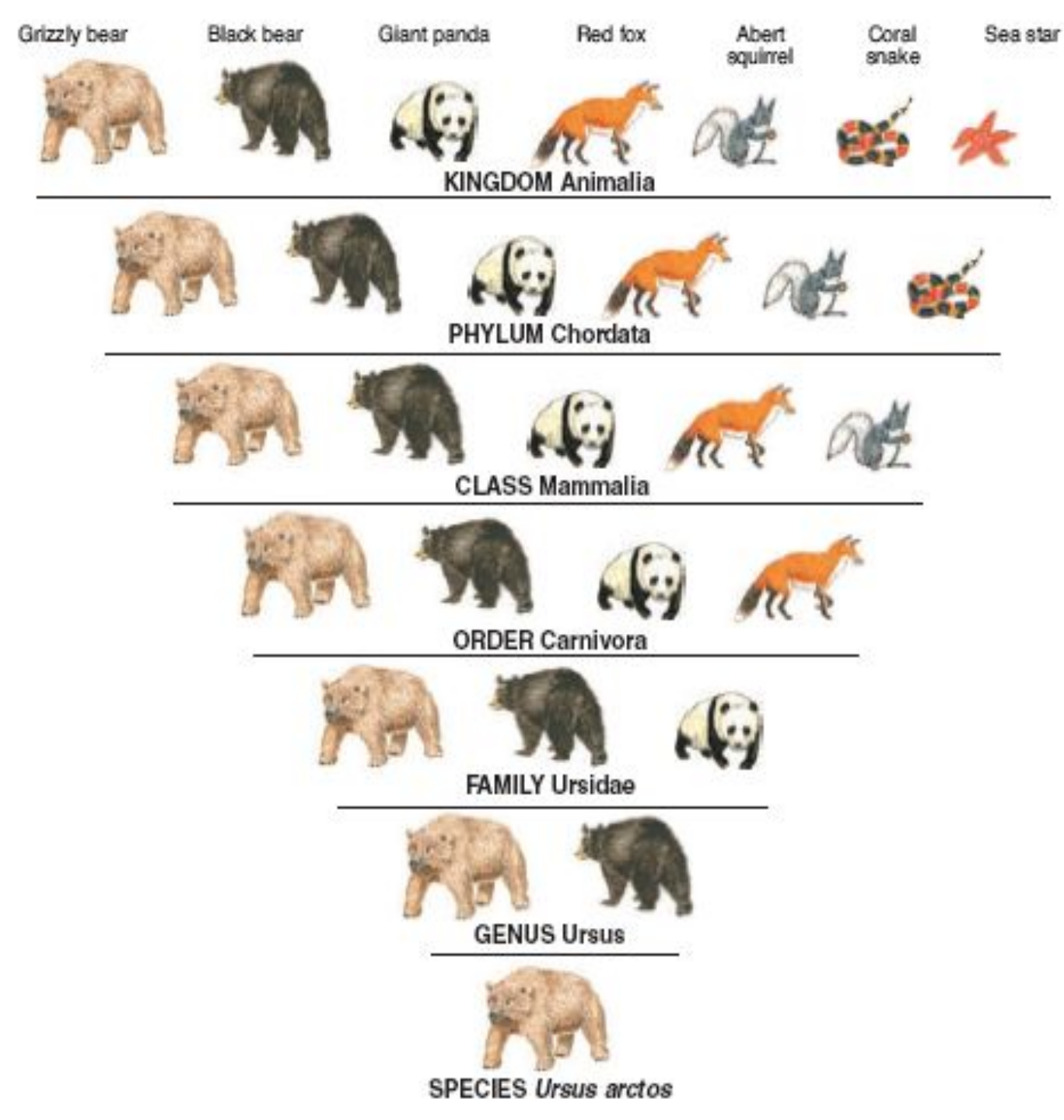
Class

Order

Family

Genus

Species



King

Phillip

Came

Over

For

Gooseberry

Soup!

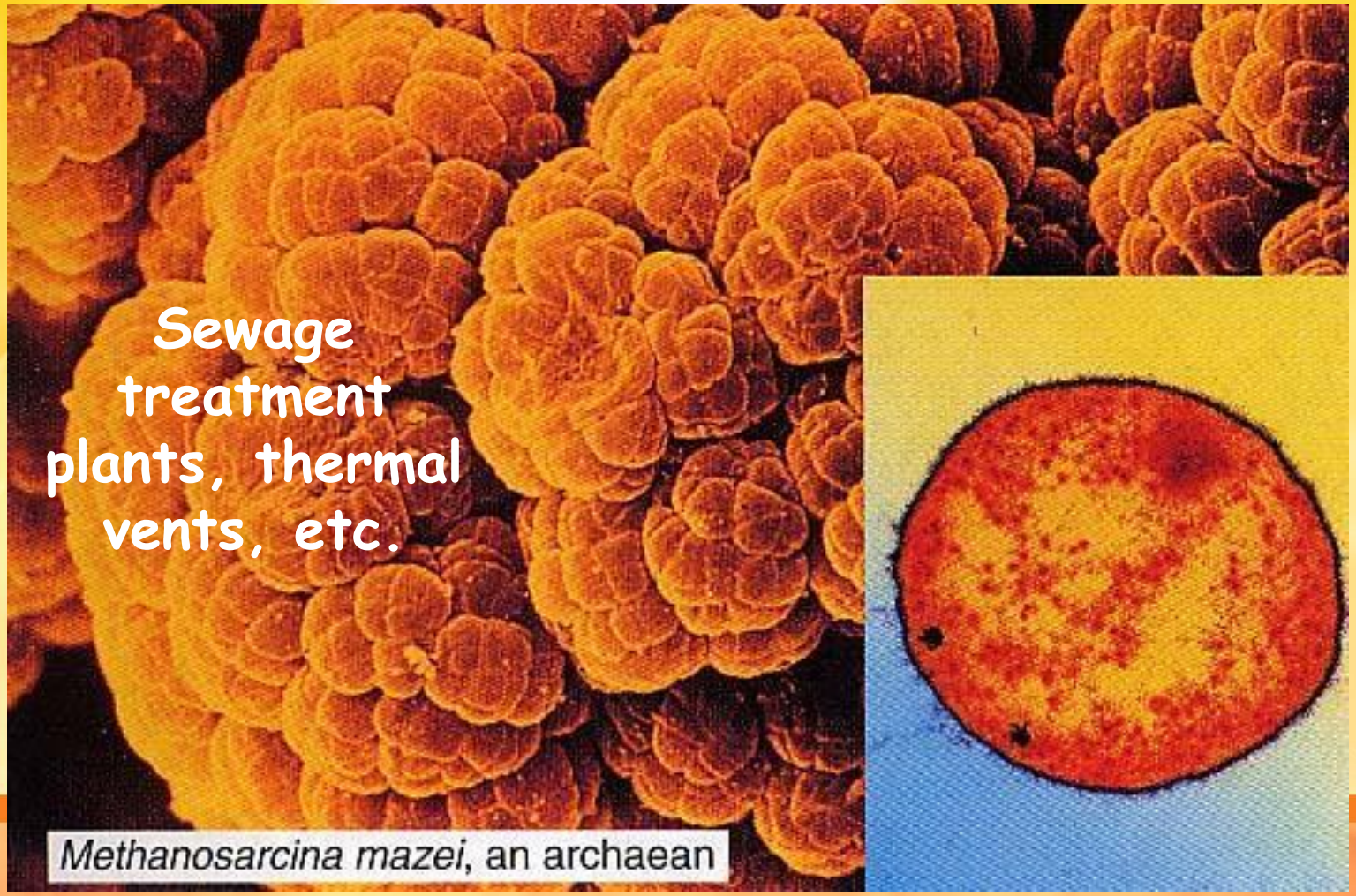
Table 1.1 Classification of Humans

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

Domains

- **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

Archaea live in **harsh environments** and may represent the first cells to have evolved.



Eubacteria, some of which cause human diseases, are present in almost **all habitats** on earth.

Many bacteria are important environmentally and commercially.

Domain Eukarya is Divided into Kingdoms

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

Protista

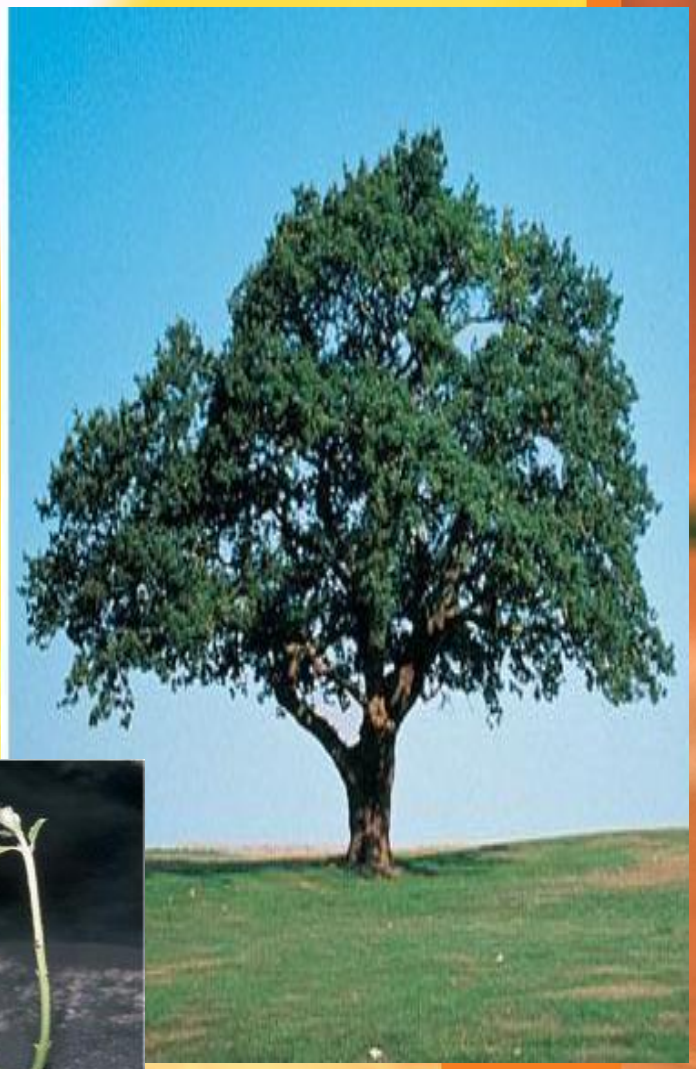
- Most are unicellular
- Some are multicellular
- Some are autotrophic, while others are heterotrophic

Fungi

- Multicellular, except yeast
- Absorptive heterotrophs (digest food outside their body & then absorb it)
- Cell walls made of chitin

Plantae

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

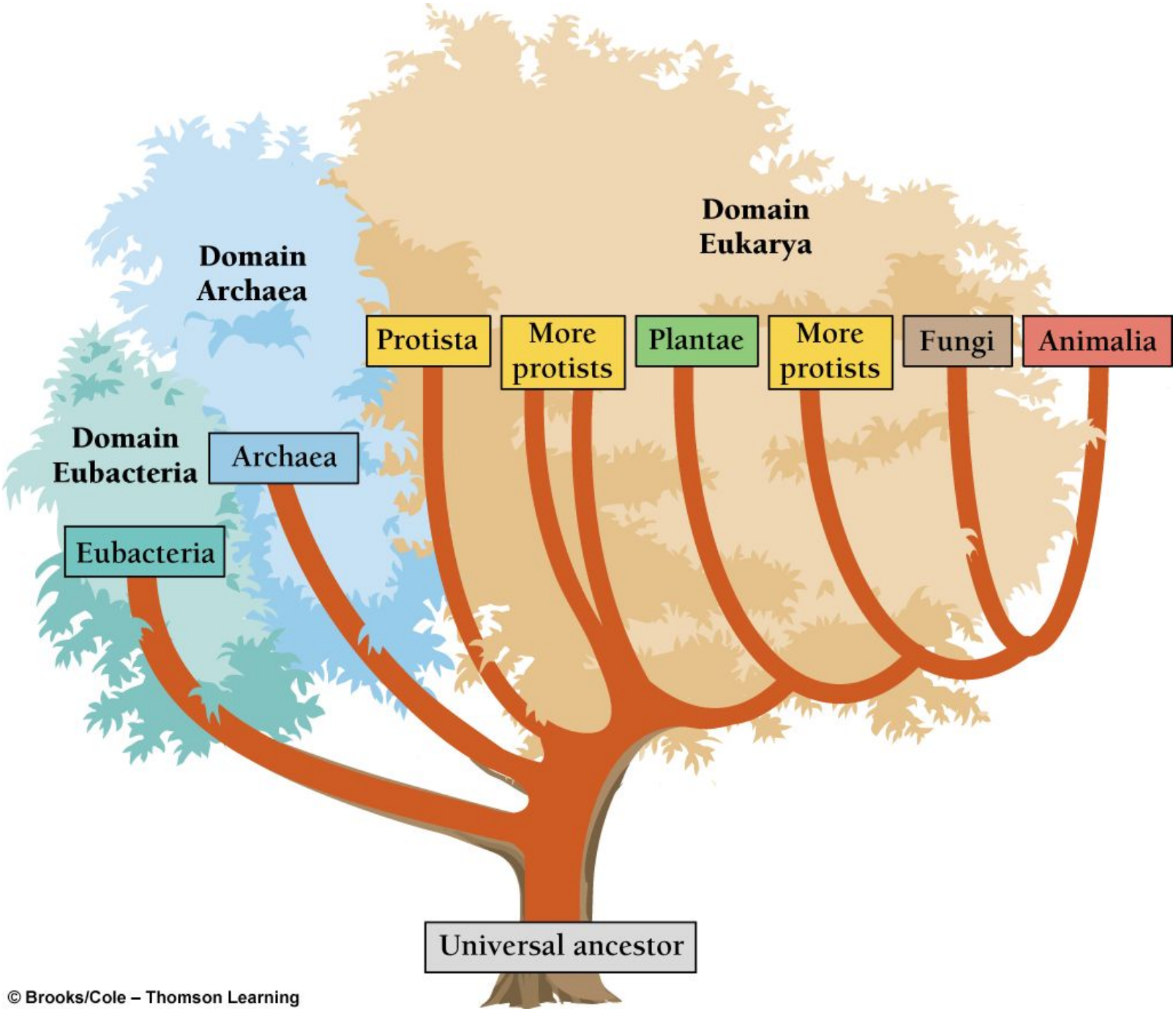


Animalia

Multicellular

Ingestive heterotrophs (consume food & digest it inside their bodies)

Feed on plants or animals

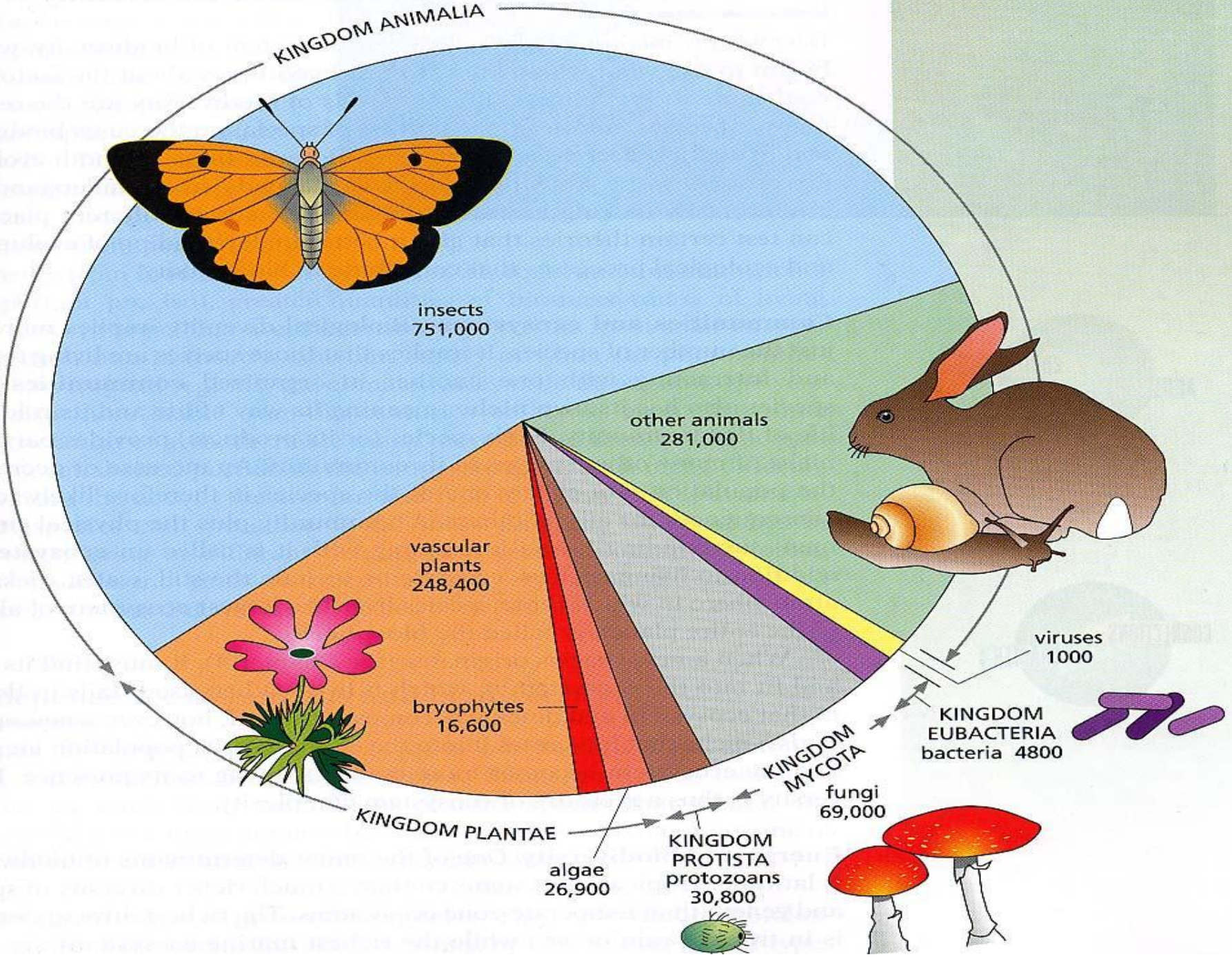


Kingdom	Organization	Type of Nutrition	Representative Organisms	
Protista	Complex single cell, some multicellular	Absorb, photo-synthesize, or ingest food	 paramecium;  euglenoid;  slime mold;  dino-flagellate	Protozoans, algae, water molds, and slime mold
Fungi	Some unicellular, most multicellular filamentous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

c. Domain Eukarya
Eukaryotes, structurally diverse and organized into the four kingdoms depicted here.

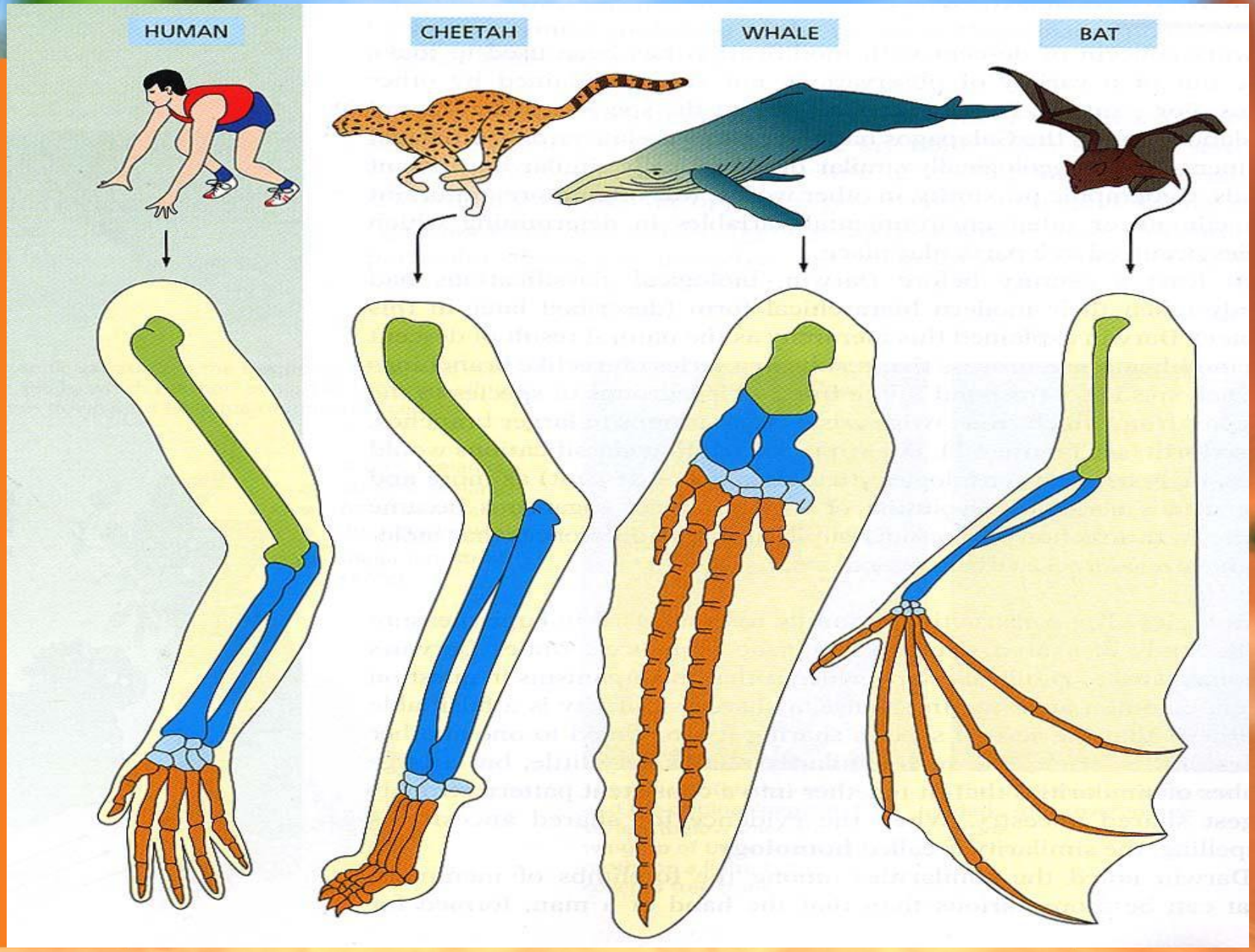
Taxons

- Most *genera* contain a number of similar species, with the exception of *Homo* that only contains modern humans
- Classification is based on evolutionary relationships


KINGDOM ANIMALIA
insects
751,000
other animals
281,000
vascular
plants
248,400
bryophytes
16,600
KINGDOM PLANTAE
algae
26,900
KINGDOM
PROTISTA
protozoans
30,800
KINGDOM
MYCOTA
fungi
69,000
KINGDOM
EUBACTERIA
bacteria 4800
viruses
1000

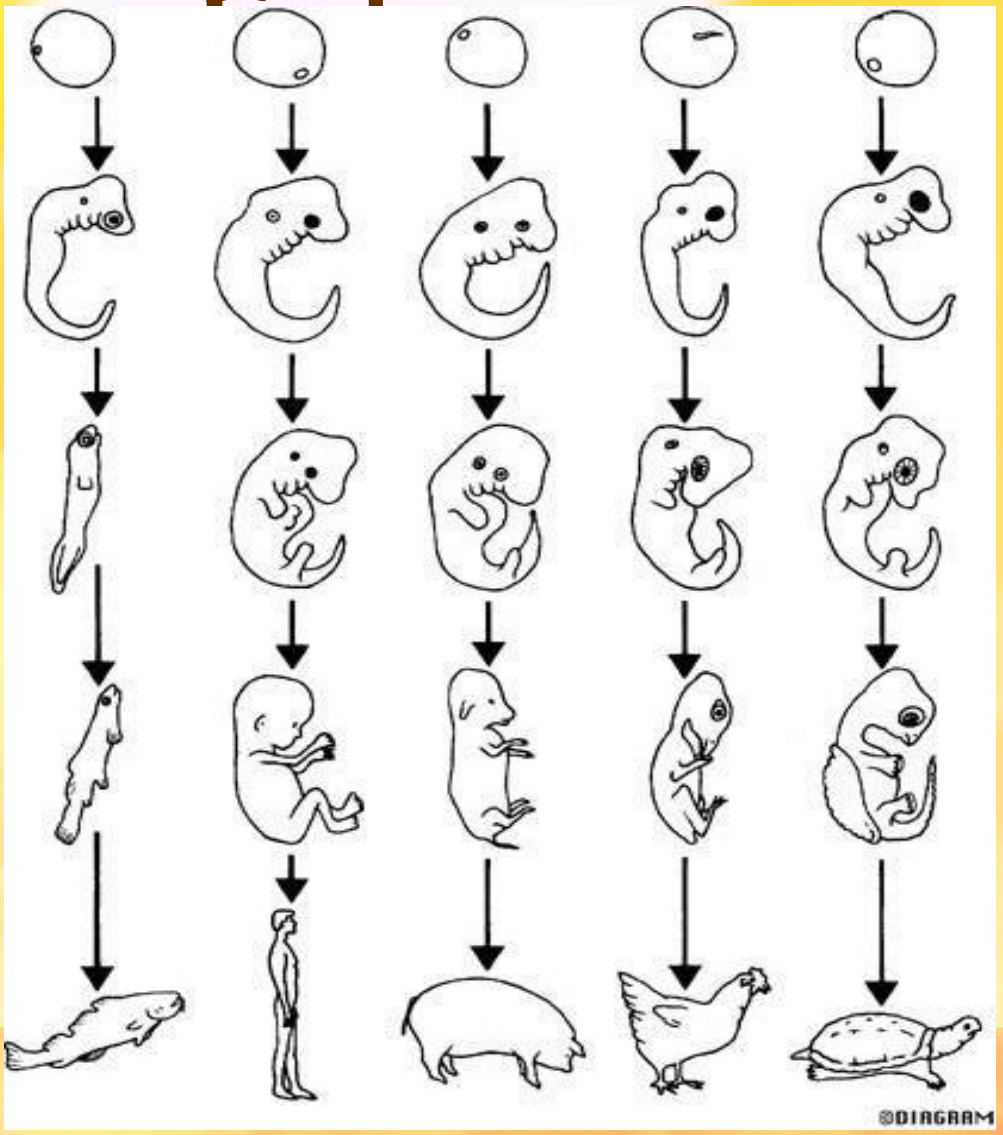
Basis for Modern Taxonomy

- Homologous structures (same structure, different function)
- Similar embryo development
- Similarity in DNA, RNA, or amino acid sequence of Proteins



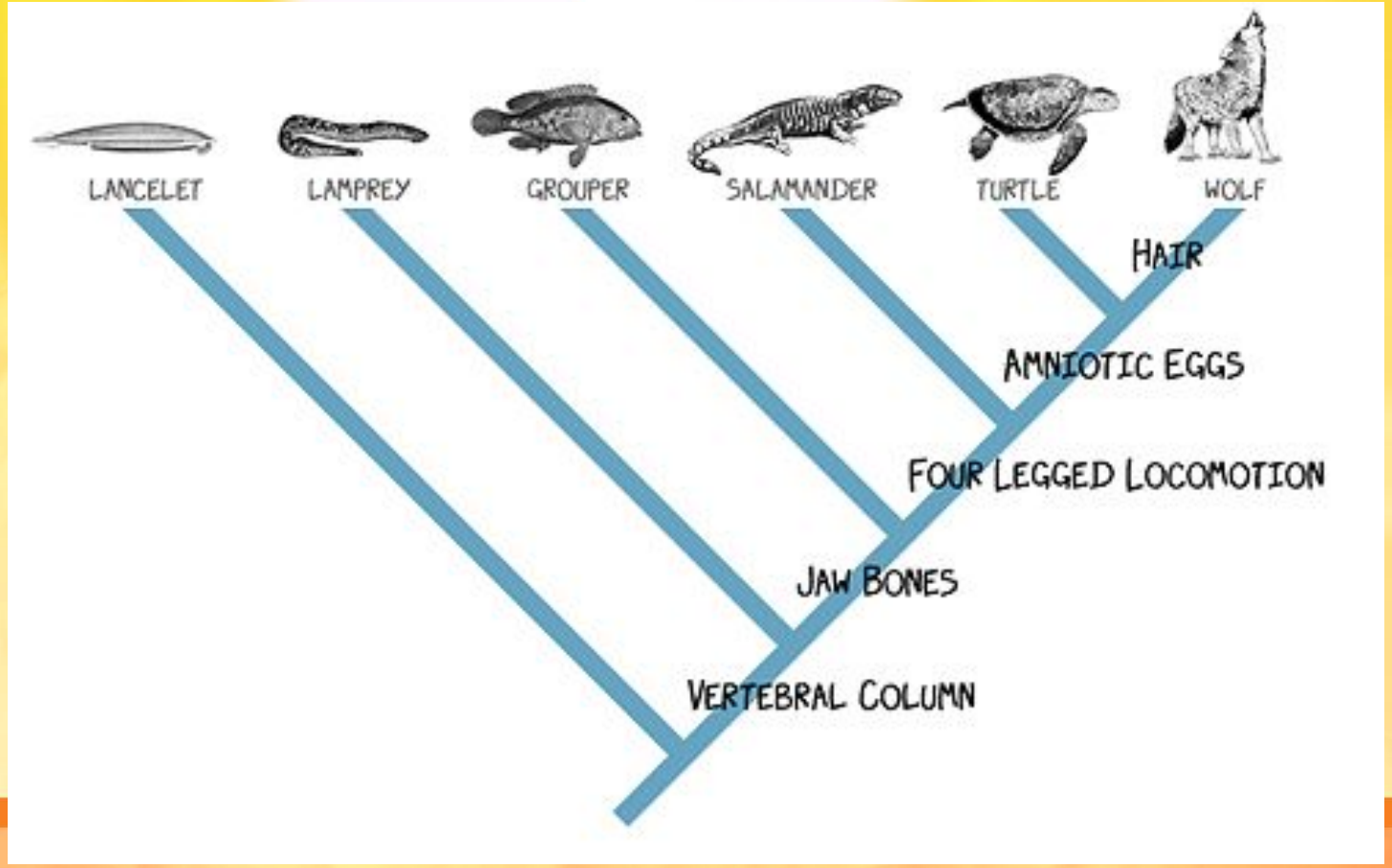
Homologous Structures show Similarities in mammals

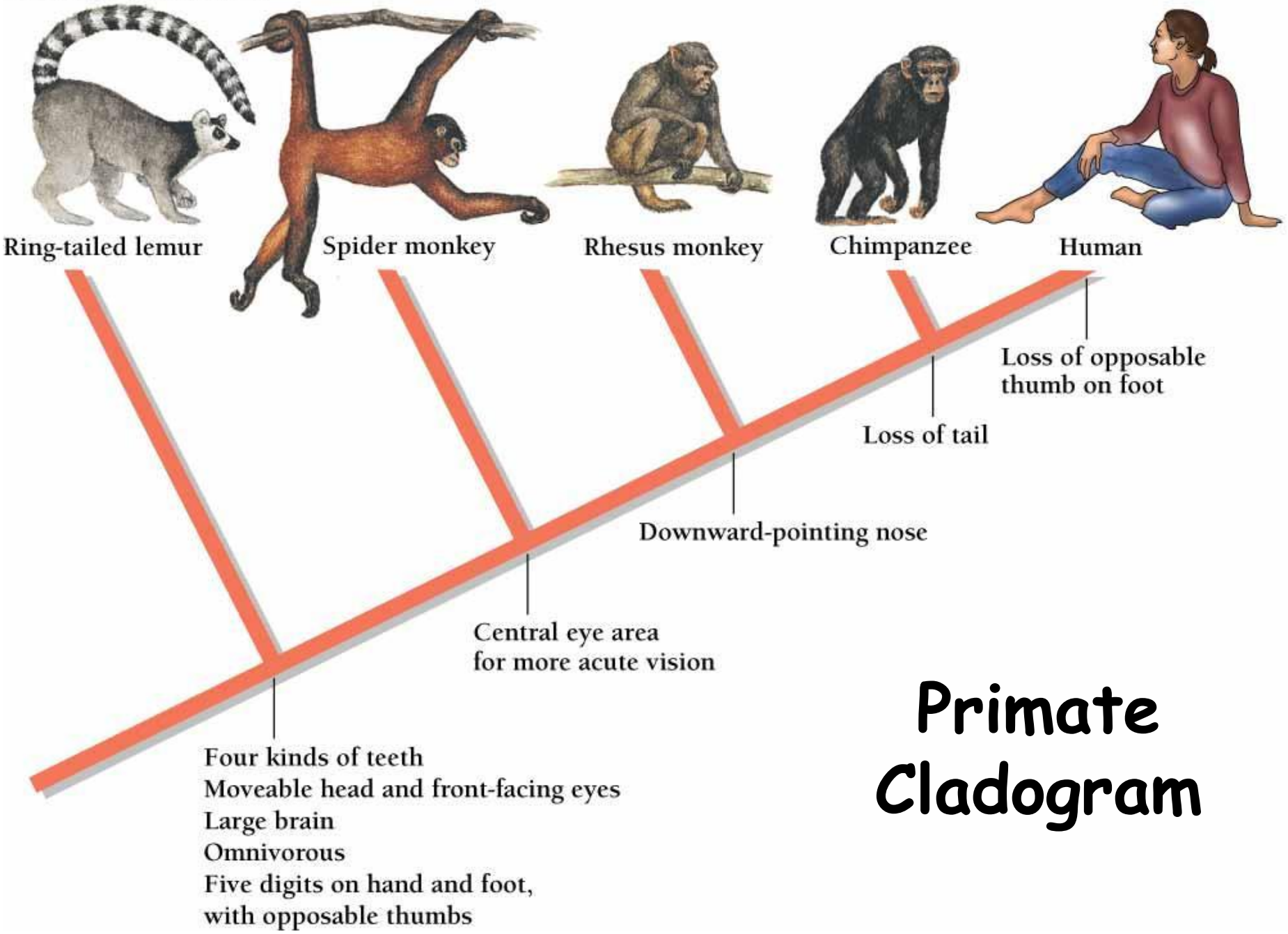
Similarities in Vertebrate



Cladogram

Diagram showing how organisms are related based on shared, derived characteristics such as feathers, hair, or scales





Primate Cladogram

Dichotomous Keying

- Used to identify organisms
- Characteristics given in pairs
- Read both characteristics

and either go to another set of characteristics OR identify the organism

Example of Dichotomous Key

1a Tentacles present – Go to 2
1b Tentacles absent – Go to 3
2a Eight Tentacles – Octopus
2b More than 8 tentacles – 3
3a Tentacles hang down – go to 4
3b Tentacles upright–Sea Anemone
4a Balloon-shaped body–Jellyfish
4b Body NOT balloon-shaped - 5