General Biology
Basic Biology

Credit: 2/1

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Biology as a Science

- **Object:**
- **Problem:**
- **Body of Knowledge:**
- **Methodology:**

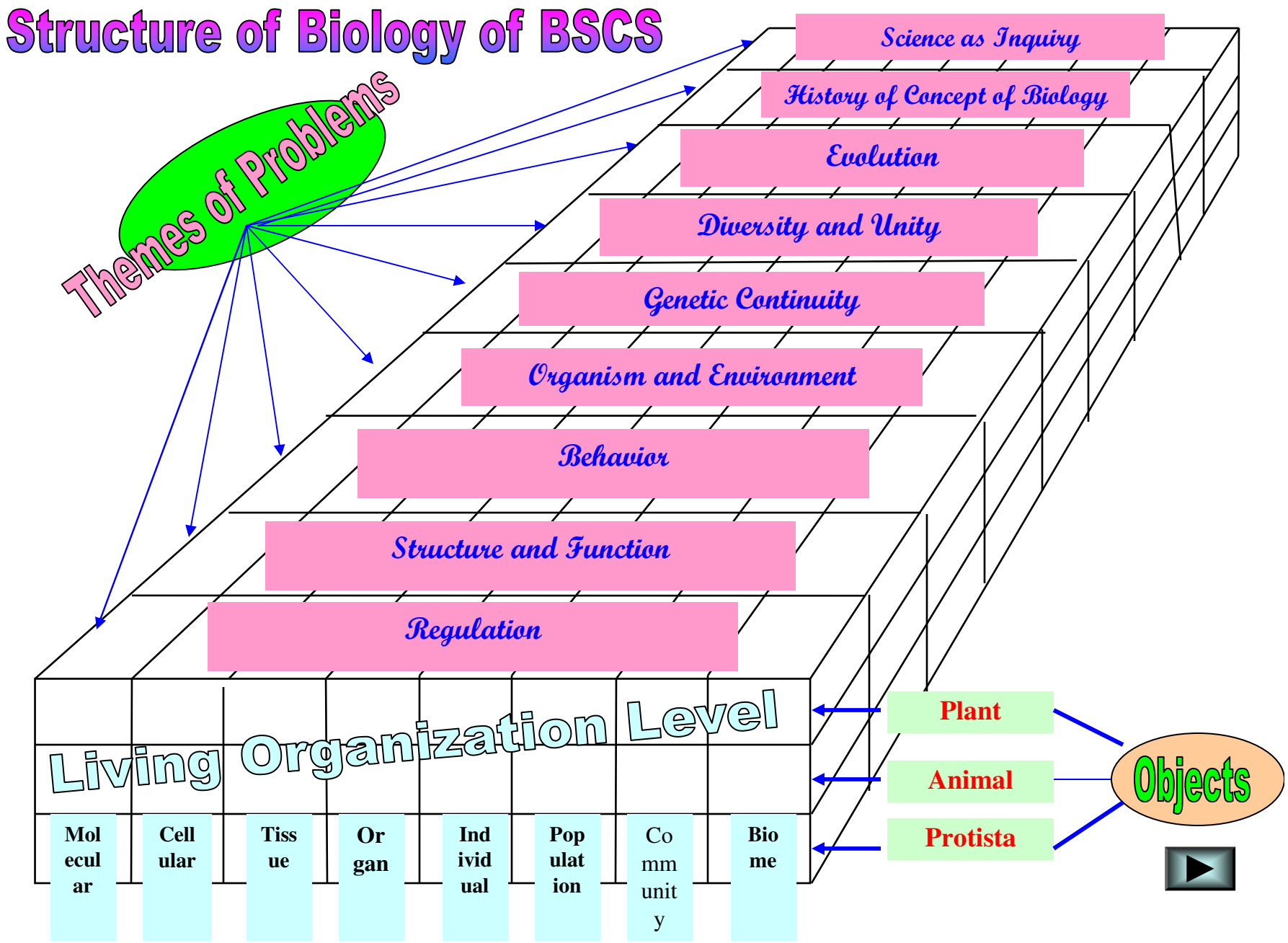
- (Phenomena)
- Fact (Facts)
- Concept (Construct)
- Proposition(s) (Principle(s))
- Law (Postulat)
- Theory

Biological Object and Problem

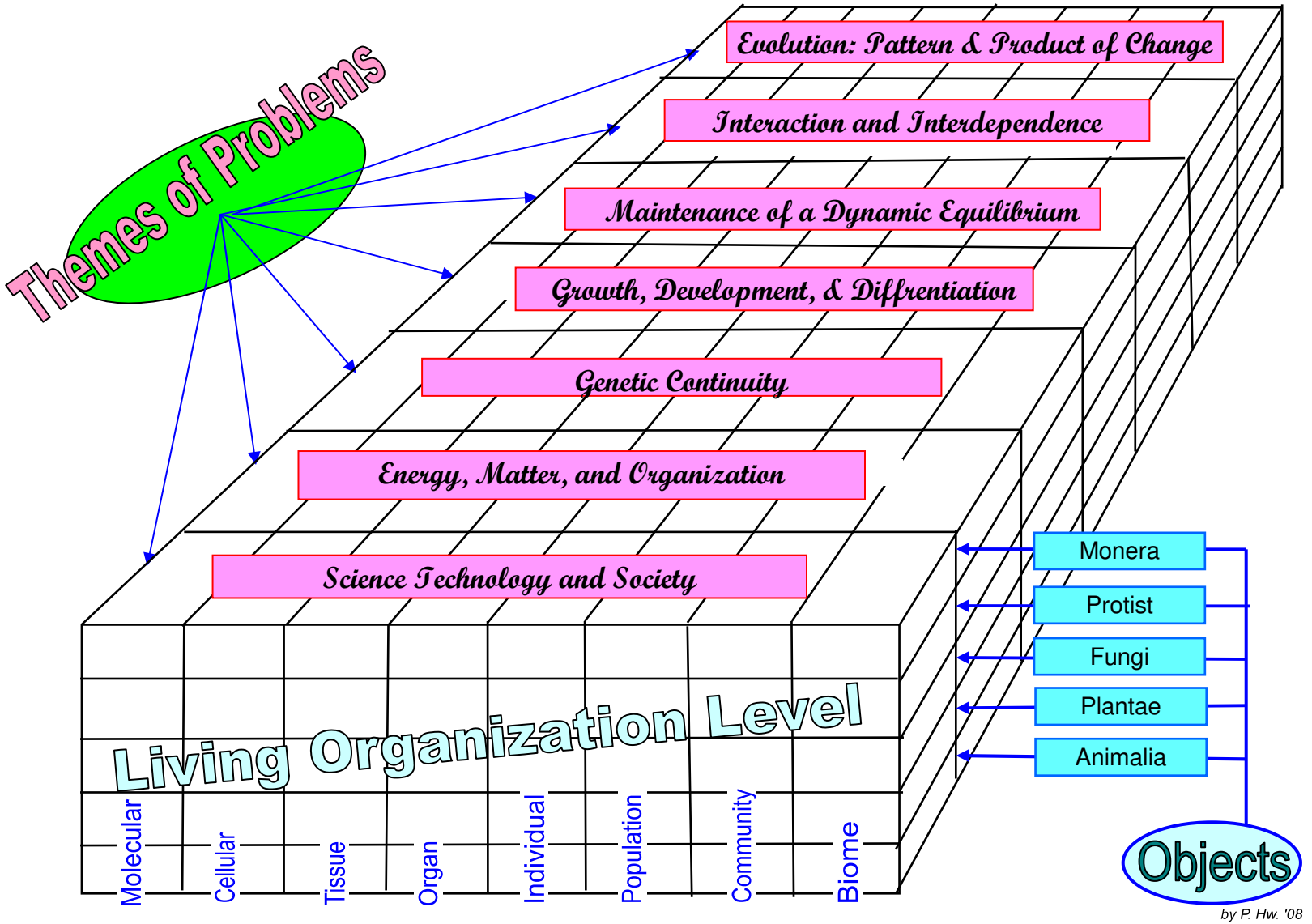
as to BSCS

BSCS Biological Science Curriculum Study

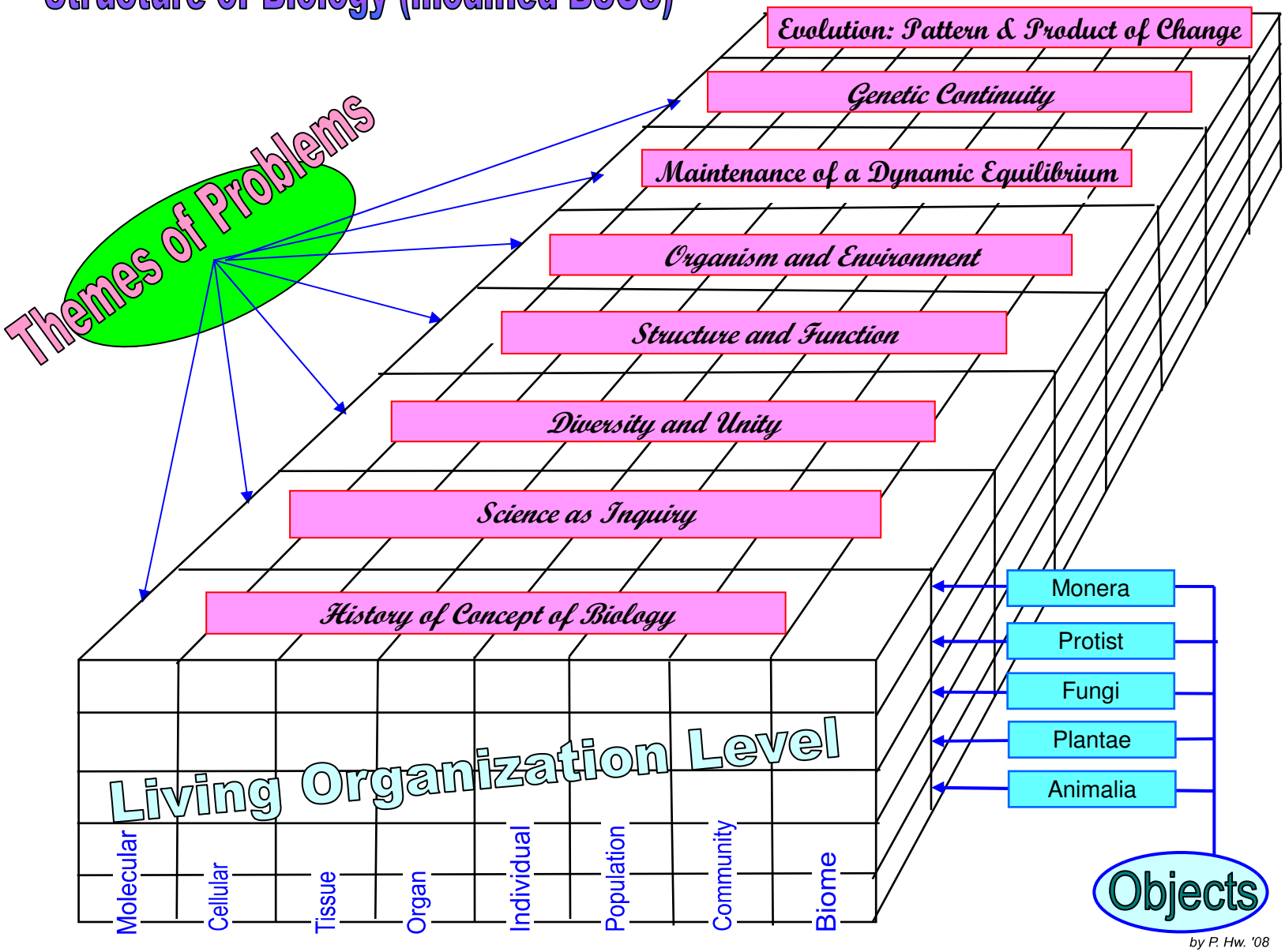
- Green Version
- Blue Version
- Yellow Version


Structure of Biology of BSCS
Themes of Problems
Science as Inquiry
History of Concept of Biology
Evolution
Diversity and Unity
Genetic Continuity
Organism and Environment
Behavior
Structure and Function
Regulation
Living Organization Level
Molecular
Cellular
Tissue
Organ
Individual
Population
Community
Biome
Plant
Animal
Protista
Objects

Structure of Biology of BSCS (Revised)



Structure of Biology (modified BSCS)



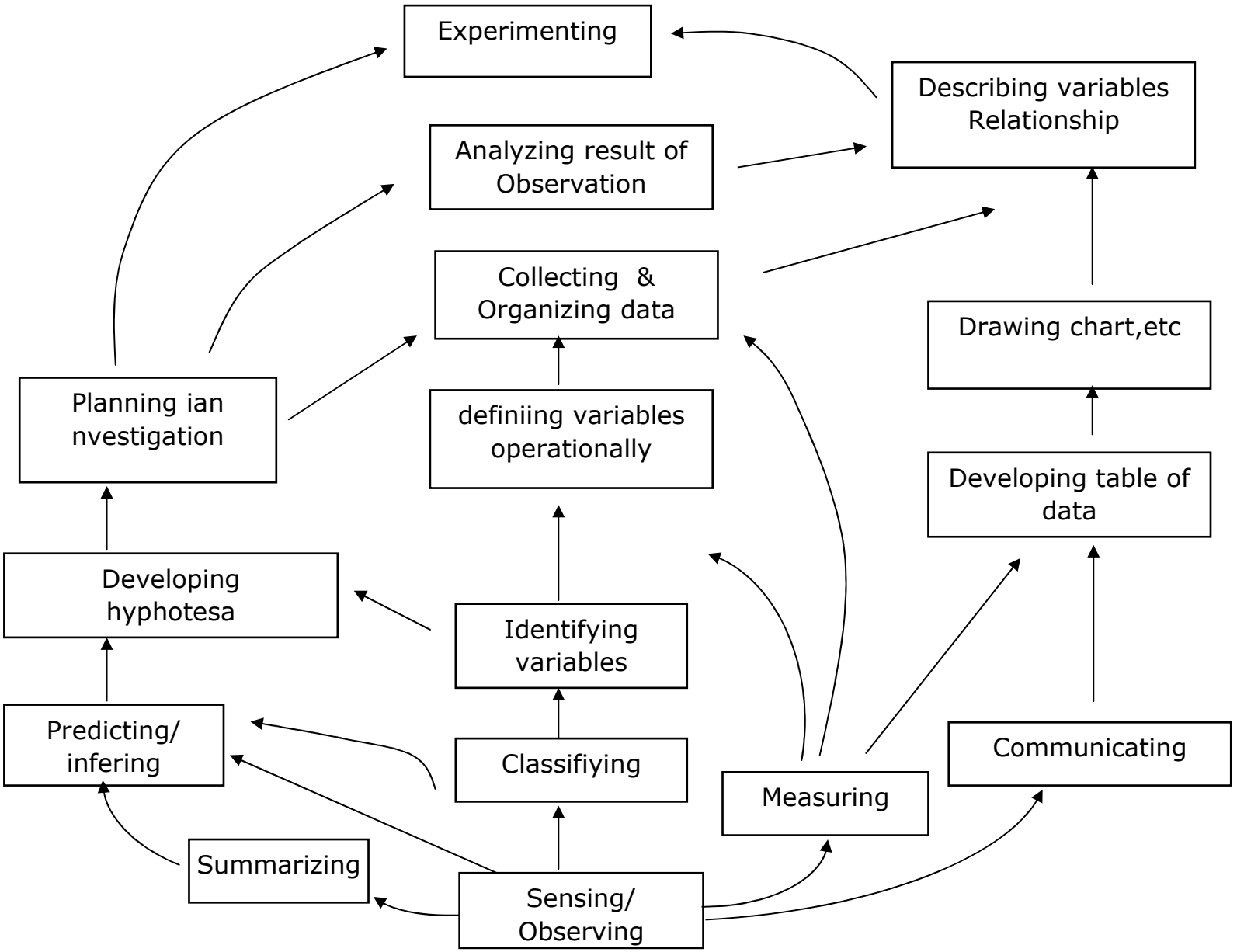
Themes of Biological Problems

NO	BSCS	REVISED BSCS	MODIFIED BSCS
1.	Science as Inquiry	Evolution: Pattern & Product of Change	History of Concept of Biology
2.	History of Concept of Biology	Interaction and Interdependence	Science as Inquiry
3.	Evolution	Maintenance of a Dynamic Equilibrium	Diversity and Unity
4.	Diversity and Unity	Growth, Development, & Diffrentiation	Structure and Function
5.	Genetic Continuity	Genetic Continuity	Organism and Environment
6.	Organism and Environment	Energy, Matter, and Organization	Maintenance of a Dynamic Equilibrium
7.	Behavior	Science Technology and Society	Genetic Continuity
8.	Structure and Function		Evolution: Pattern & Product of Change
9.	Regulation		

Biology as a Science

- **Object:**
- **Problem:**
- **Body of Knowledge:**
- **Metodhology:**

Title of research/investigation/study:



Picture 1. S*cientific skill* (Rezba *et al*, 1995: 1)

Time Allocation: 2 x 50’

Learning Objective (s):

1. To identify varieties in one group of organisms
2. To identify uniformity in varieties of organisms
3. To explain principles of diversity and unity in biology
4. To explain taxonomical and non-taxonomical diversity

Diversity & Unity

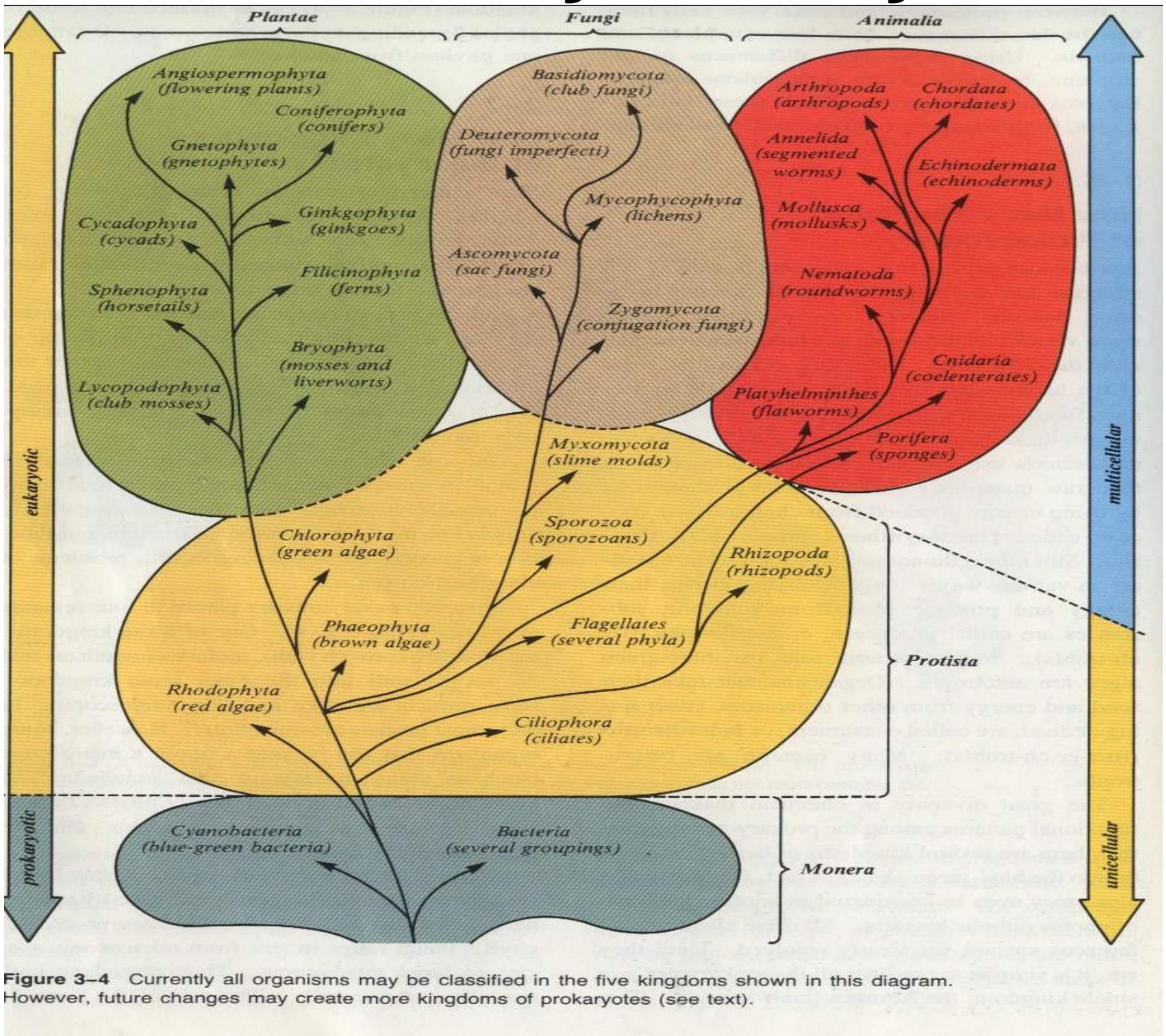
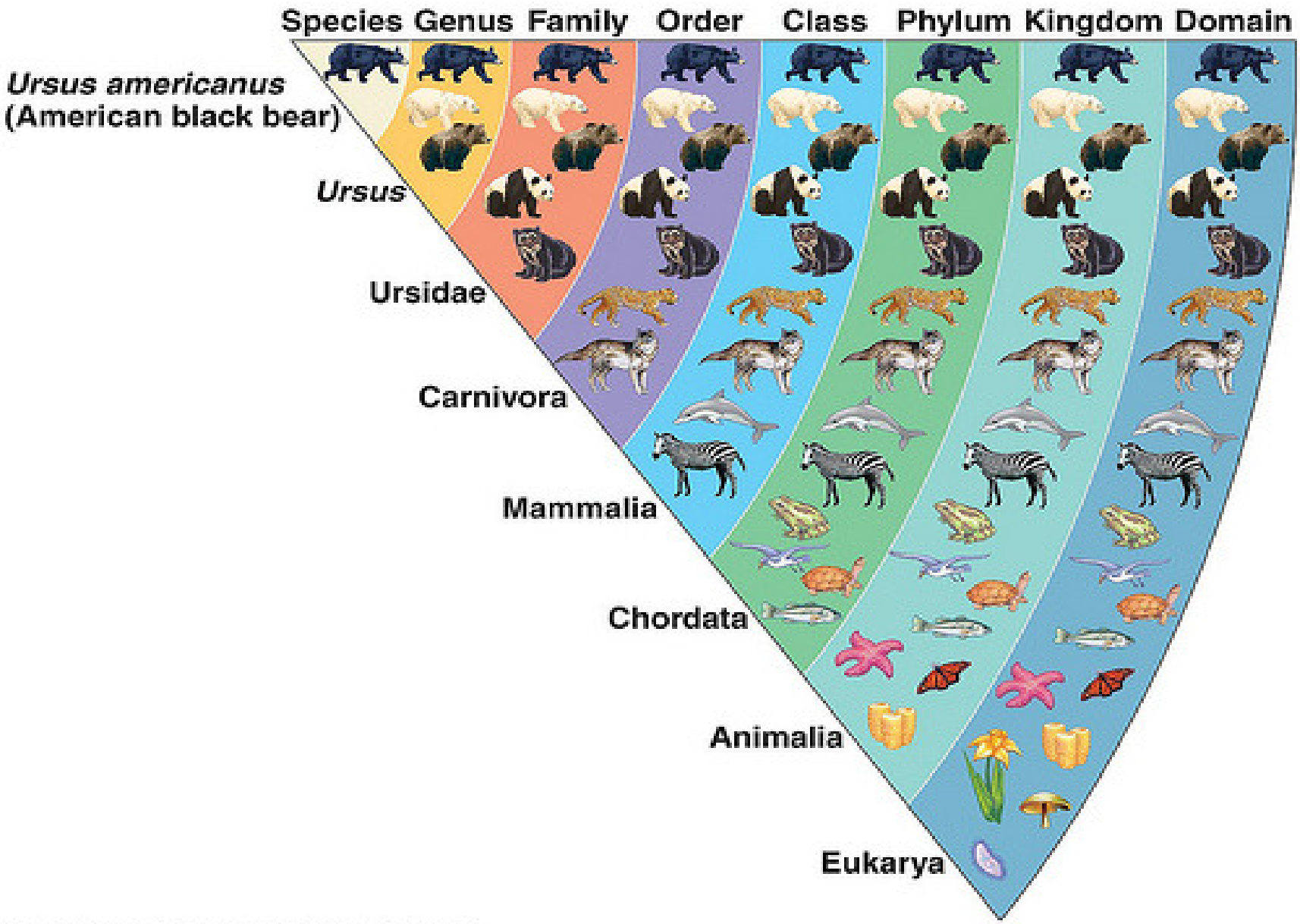


Figure 3–4 Currently all organisms may be classified in the five kingdoms shown in this diagram. However, future changes may create more kingdoms of prokaryotes (see text).

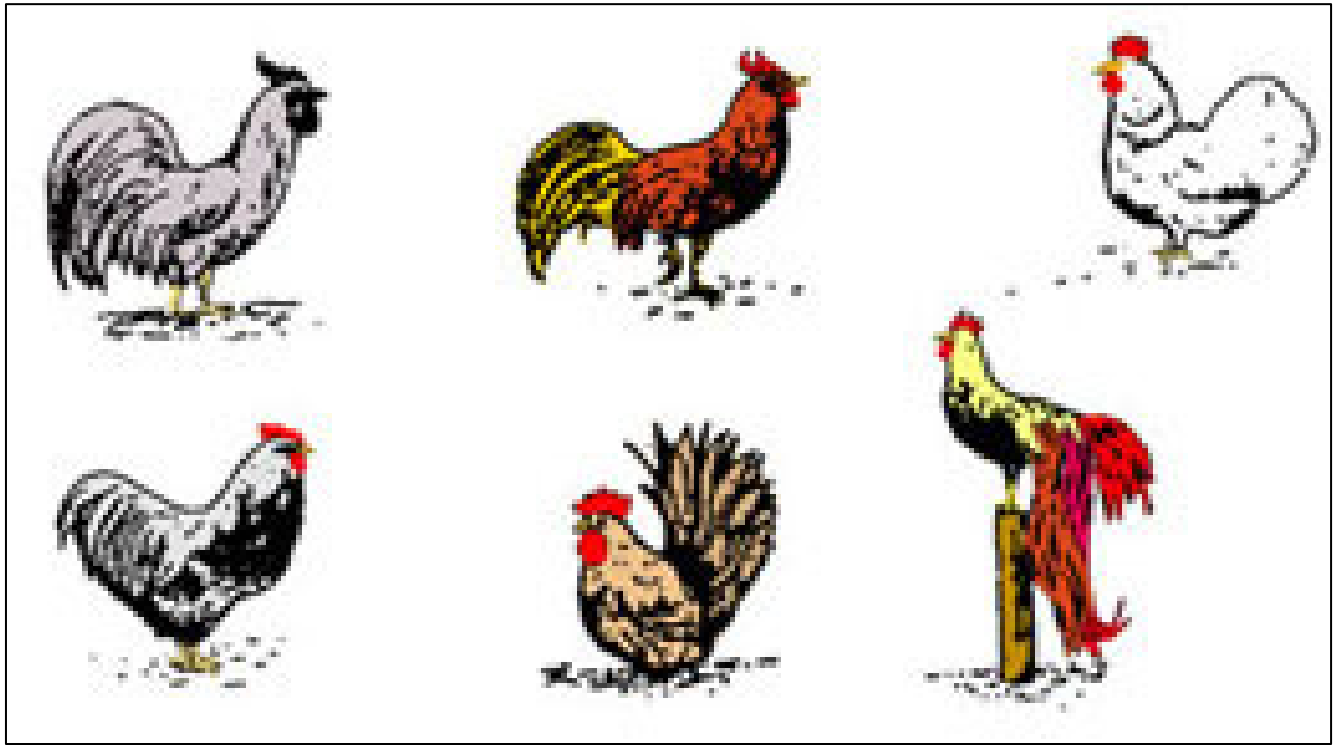
Diversity & Unity



Diversity & Unity

P. Hw.

- **Differences**
  - Gene – level ---- Within species
  - Species-level ---- Among species
  - Ecosystem-level ---- Among system
- **Similarities**
  - Morphologically
  - Anatomically
  - Bio molecularly



Var	C1	C2	C3	C4	C5	C6	
color	Gy	R-y	w	w-b	O-b	Y-r-b	
size	LL	L	LL	LLL	m	s	
Peal							
Fur							

Pete Cina
(Leucaena glauca)

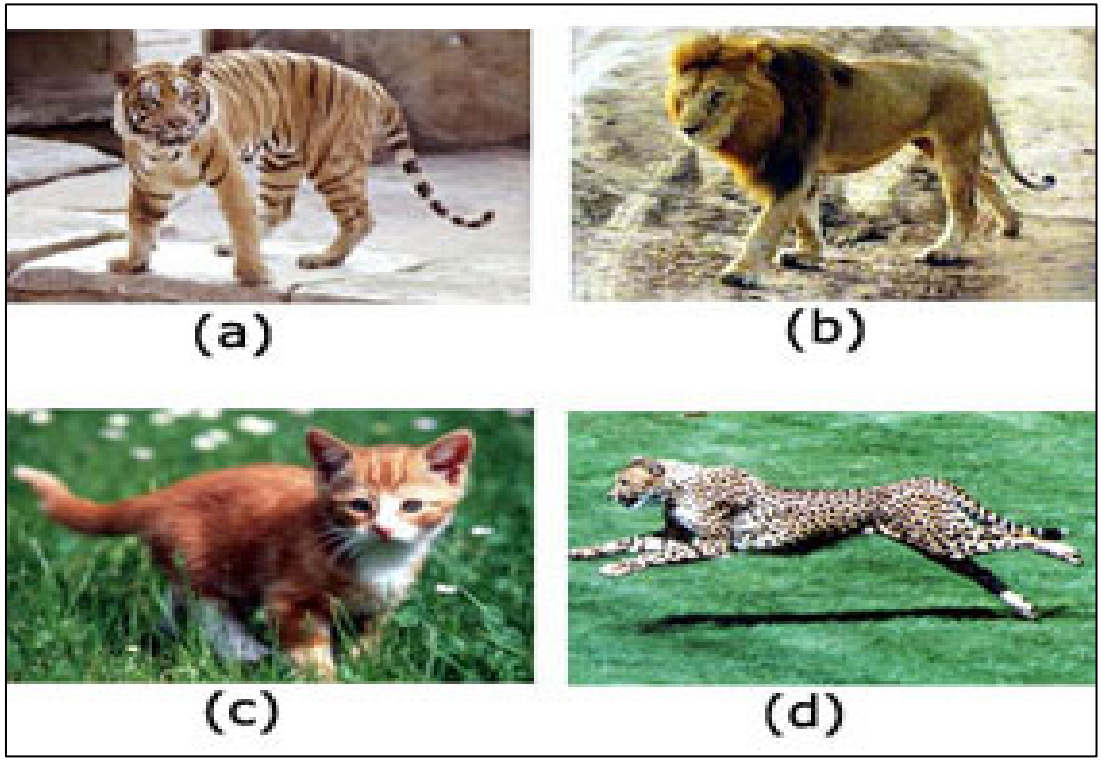
Kacang Panjang
(Vigna sinensis)

Kacang Tanah
(Arachis hypogaea)

(Pisum sativum)

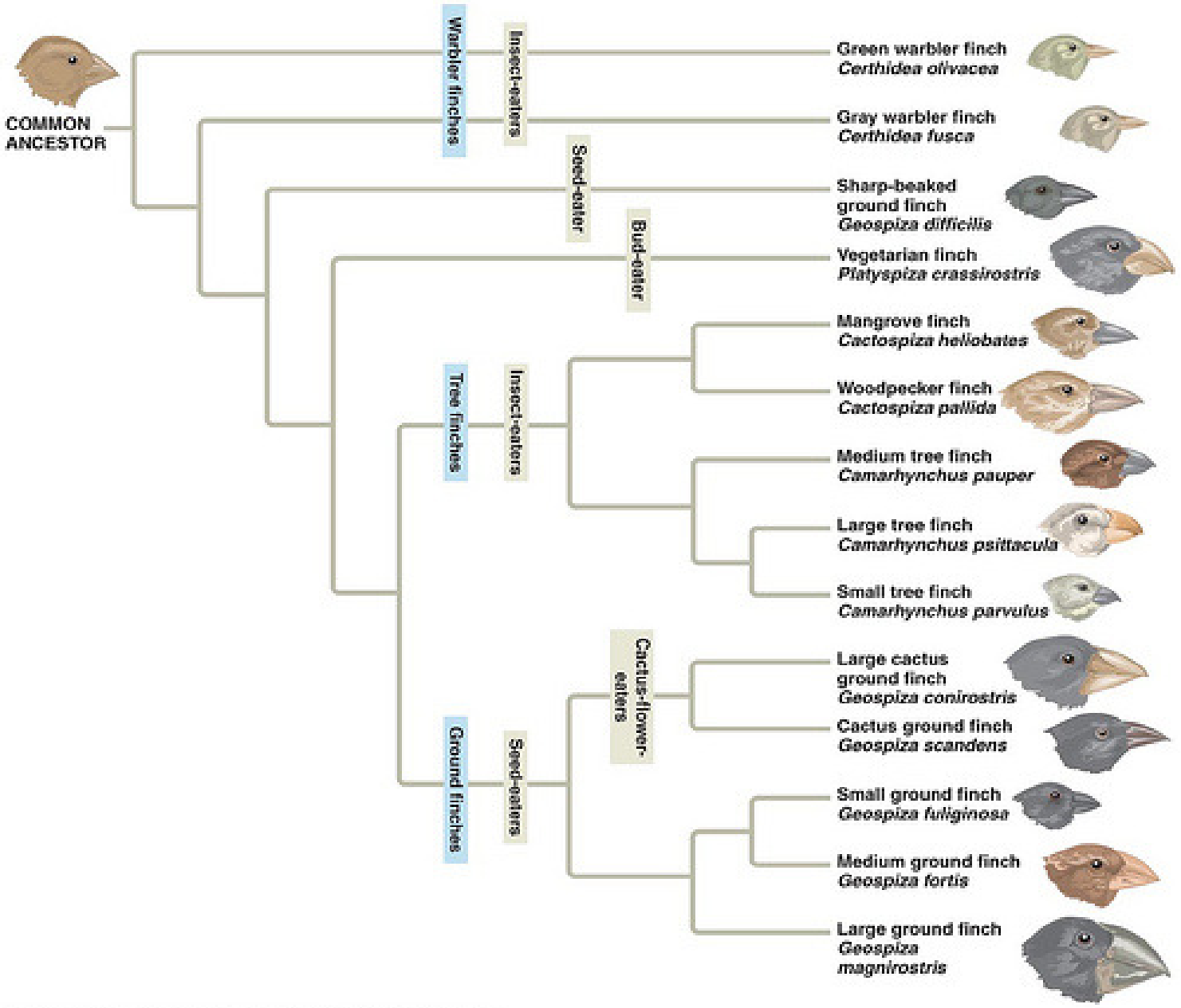
Kacang Buncis
(Phaseolus vulgaris)

Kacang Hijau
(Phaseolus radiatus)



Va	a	b	c	d			
Size	LL	LLL	S	L			
Color	Br-st	Br	o	Gy-sp			
pattern							
tail							



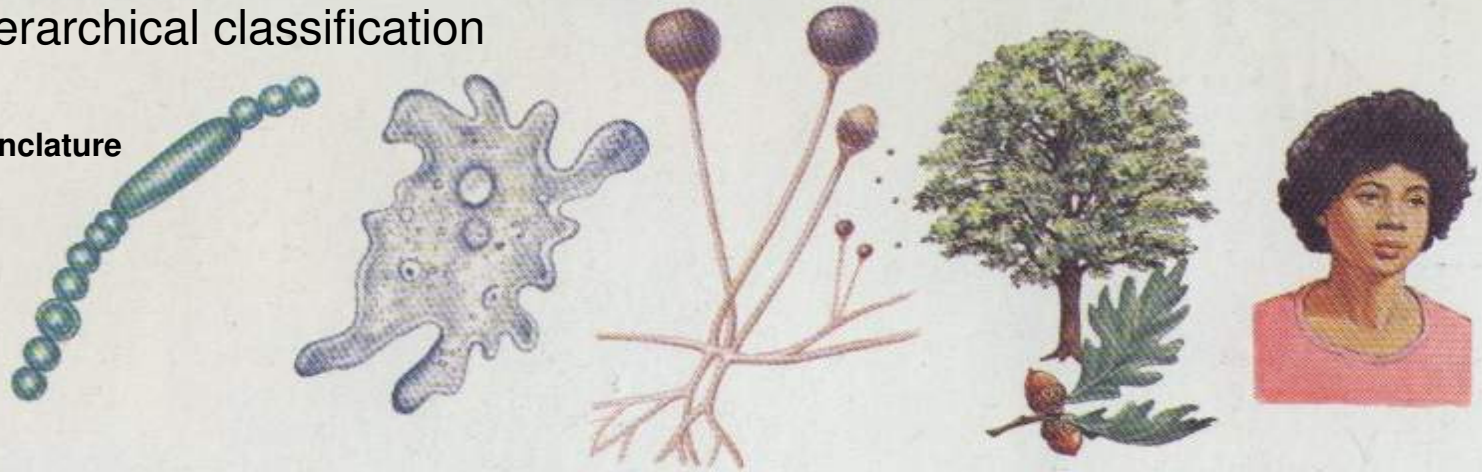


A Linnean hierarchical classification

↓

binomial nomenclature

CLASSIFICATION OF AN ORGANISM FROM EACH KINGDOM



	Anabaena blue-green algae	*Amoeba*	*Rhizopus* bread mold	*Quercus alba* white oak	*Homo sapiens* human being
kingdom	Monera	Protista	Fungi	Plant	Animal
phylum/division	Cyanophyta or Cyanobacteria	Sarcodina	Zygomycota	Anthophyta	Chordata
class	Eubacteria	Lobosa	Phycomycetes	Dicotyledoneae	Mammalia
order	Oscillatoriales	Amoebina	Mucorales	Fagales	Primates
family	Nostocaceae	Amoebidae	Mucoraceae	Fagaceae	Hominidae
genus	*Anabaena*	*Amoeba*	*Rhizopus*	*Quercus*	*Homo*
species	*Anabaena circinalis*	*Amoeba proteus*	*Rhizopus stolonifer*	*Quercus alba*	*Homo sapiens*

Kingdoms

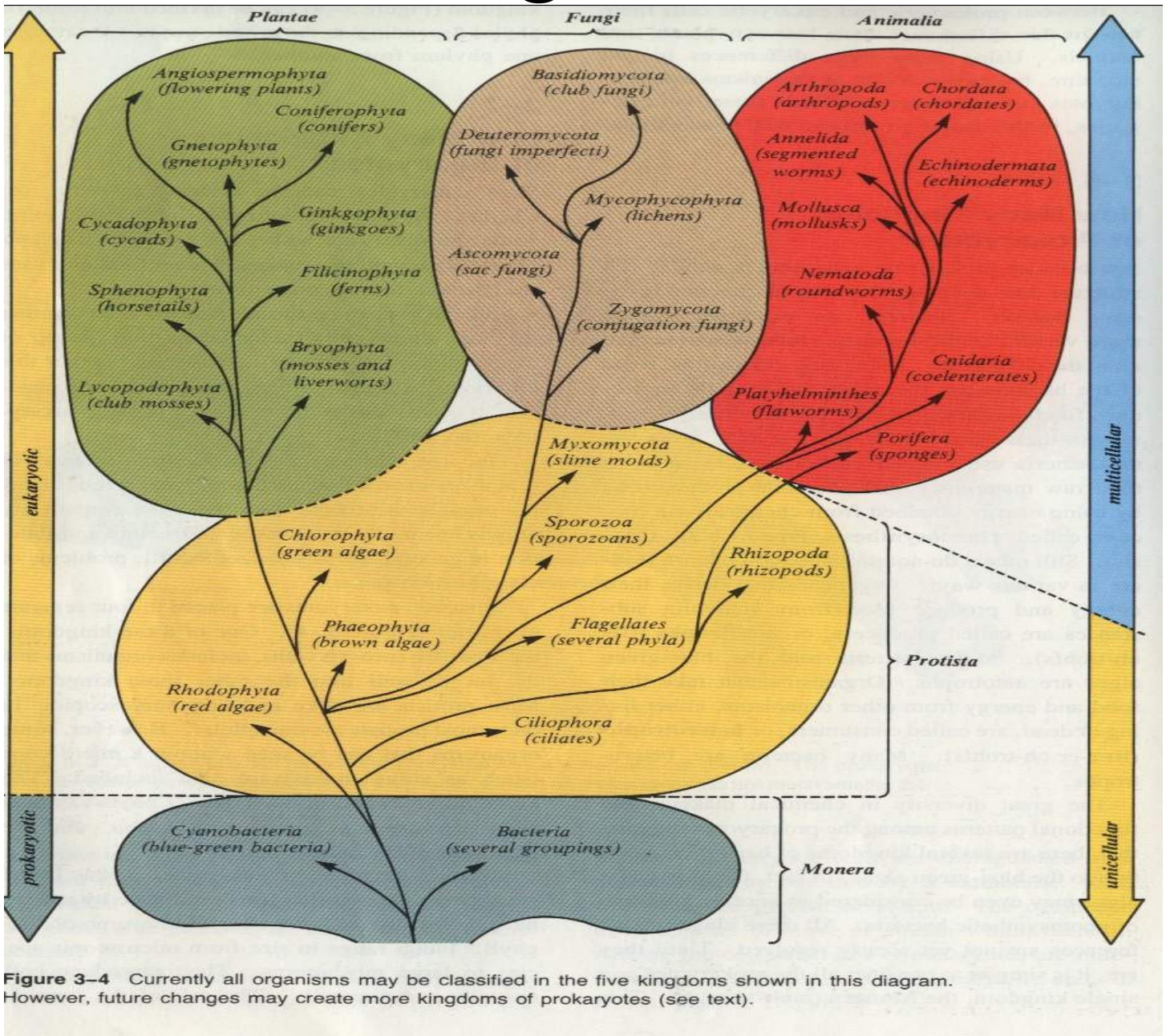
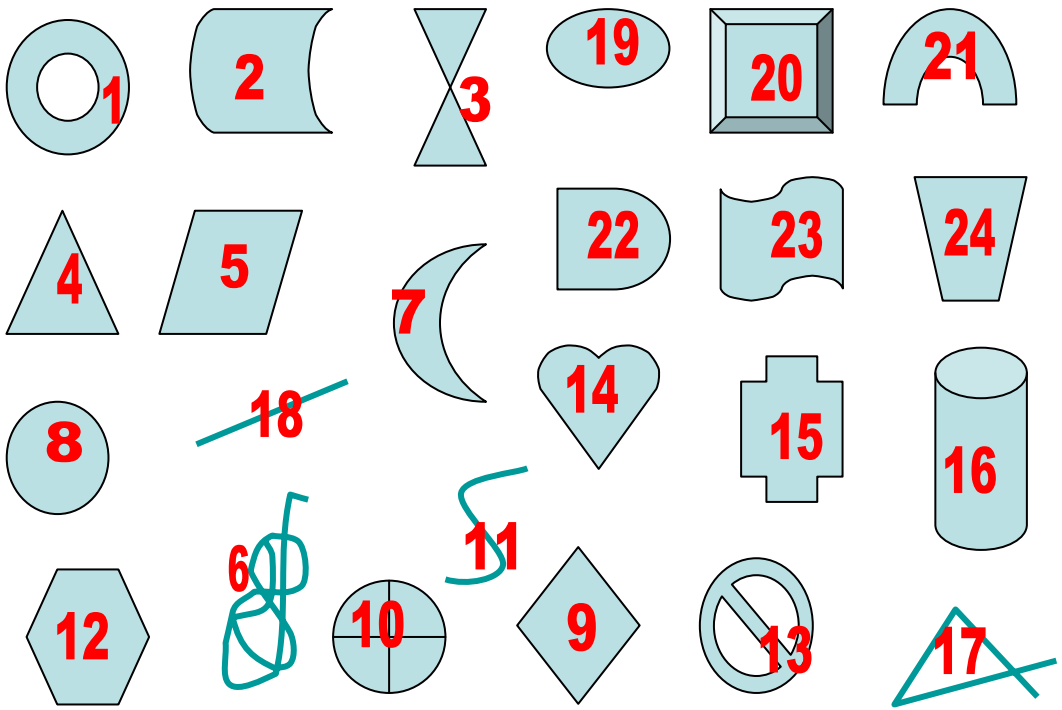


Figure 3–4 Currently all organisms may be classified in the five kingdoms shown in this diagram. However, future changes may create more kingdoms of prokaryotes (see text).


1
2
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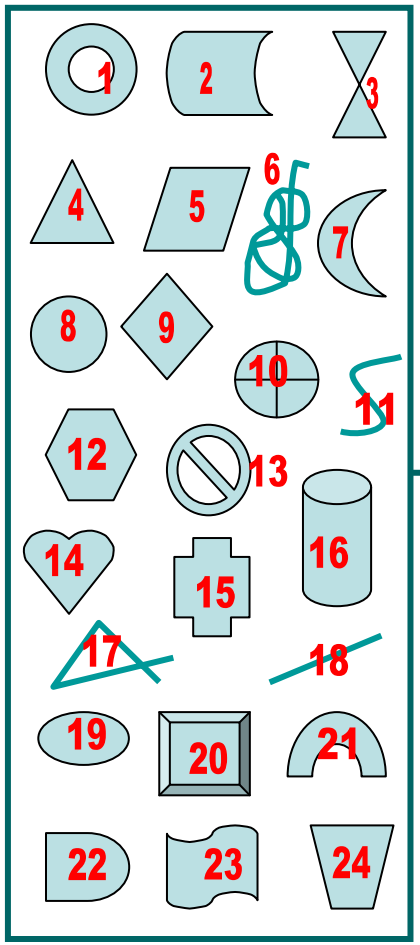
10
9
13
17

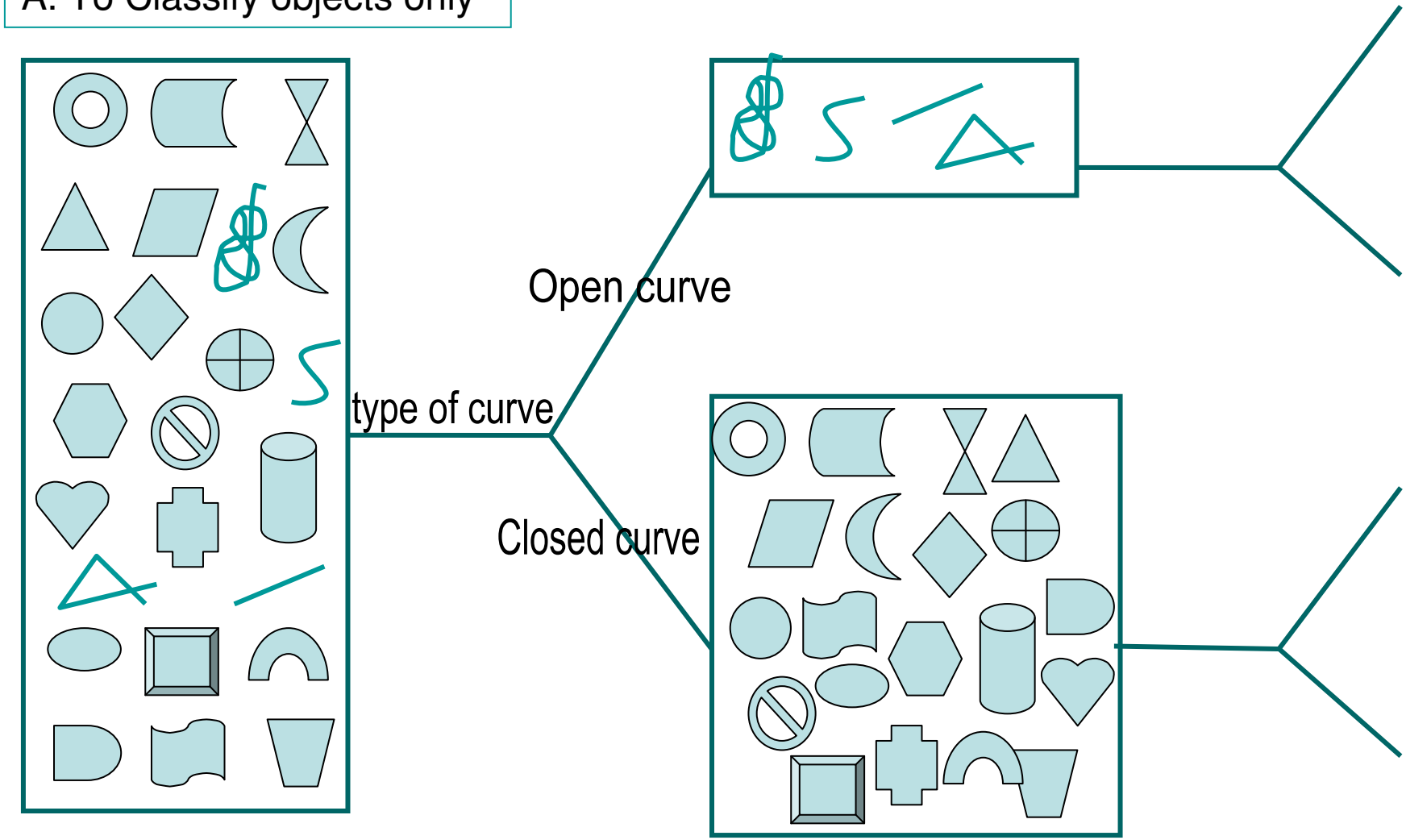
Clasiffication

A. To Classify objects only



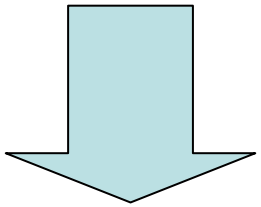
Clasiffication

A. To Classify objects only



Principles of clasiffication

- Using Observable Characteristics (observable, measurable)
- Using Stable Characteristics
- Using Not-Responsive Characteristics to environmental factors



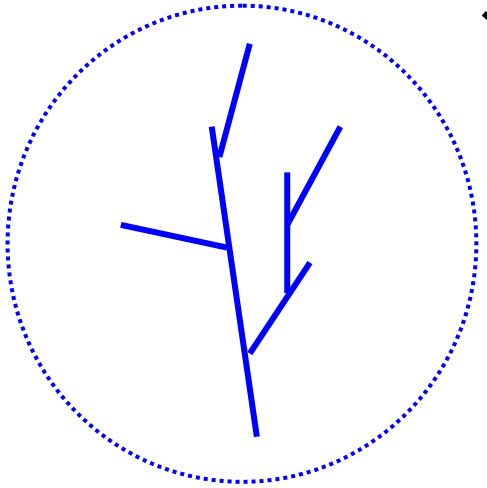
Morphological, anatomical, etc… biochemical

Clasiffication

B. To Determinate of phylogeny

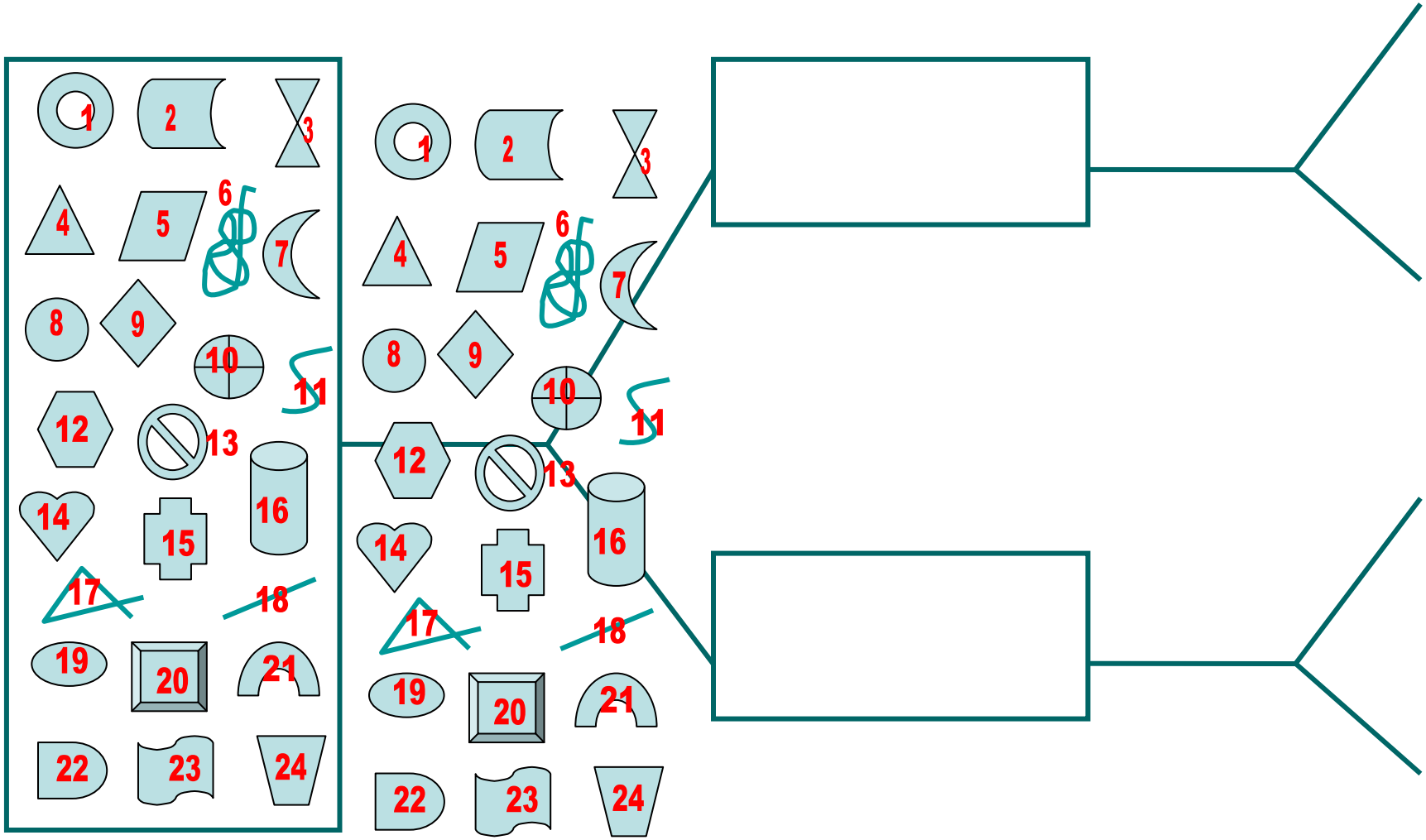
Classification of organism:

Taxonomy of organism



Phylogeny tree of organism

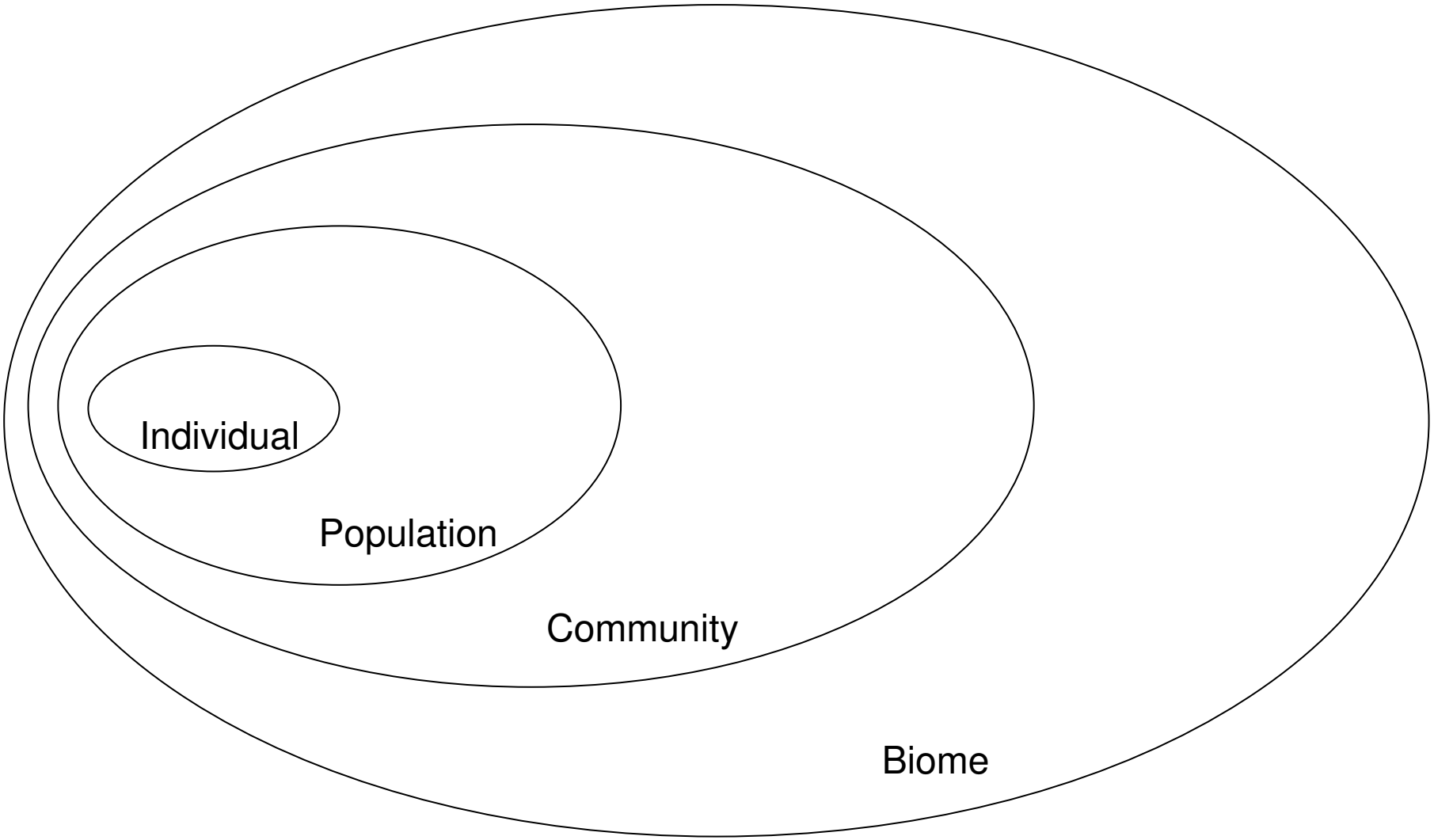
Principles of clasiffication



Methods of classification: traditional, phentic, and cladistic.

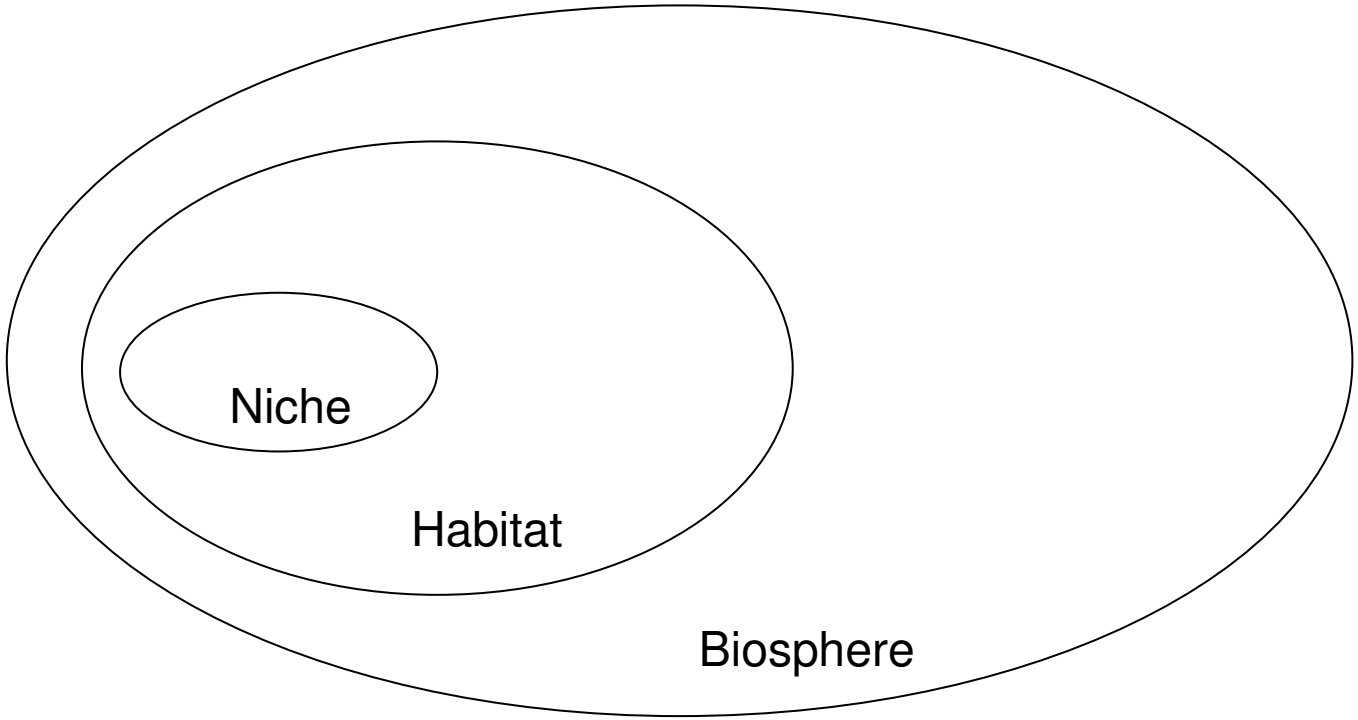
Organism and its Environment

Organism:



Organism and its Environment

Environment:



Association of Organism
and
Interaction Organism and its Environment

- Competition
  - Altruism-innate-instinctive
    - Predation (Predator - Preyor)
      - Symbiotic Relationship (mutual, parasitic, commensal)
        - Non-Symbiotic Relationship (amensalism)
          - Ecosystem

Ecosystem

P. Hw.

Components & Structure of Ecosystem

I. **Biotic (Living Thing)**
   a. Producer
   b. Consumer (herbivore, carnivore)
   c. Detritivore
   d. Decomposer

II. **Non-Biotic (Non Living Thing)**
   a. Climatic
   b. Edaphic

Ecosystem

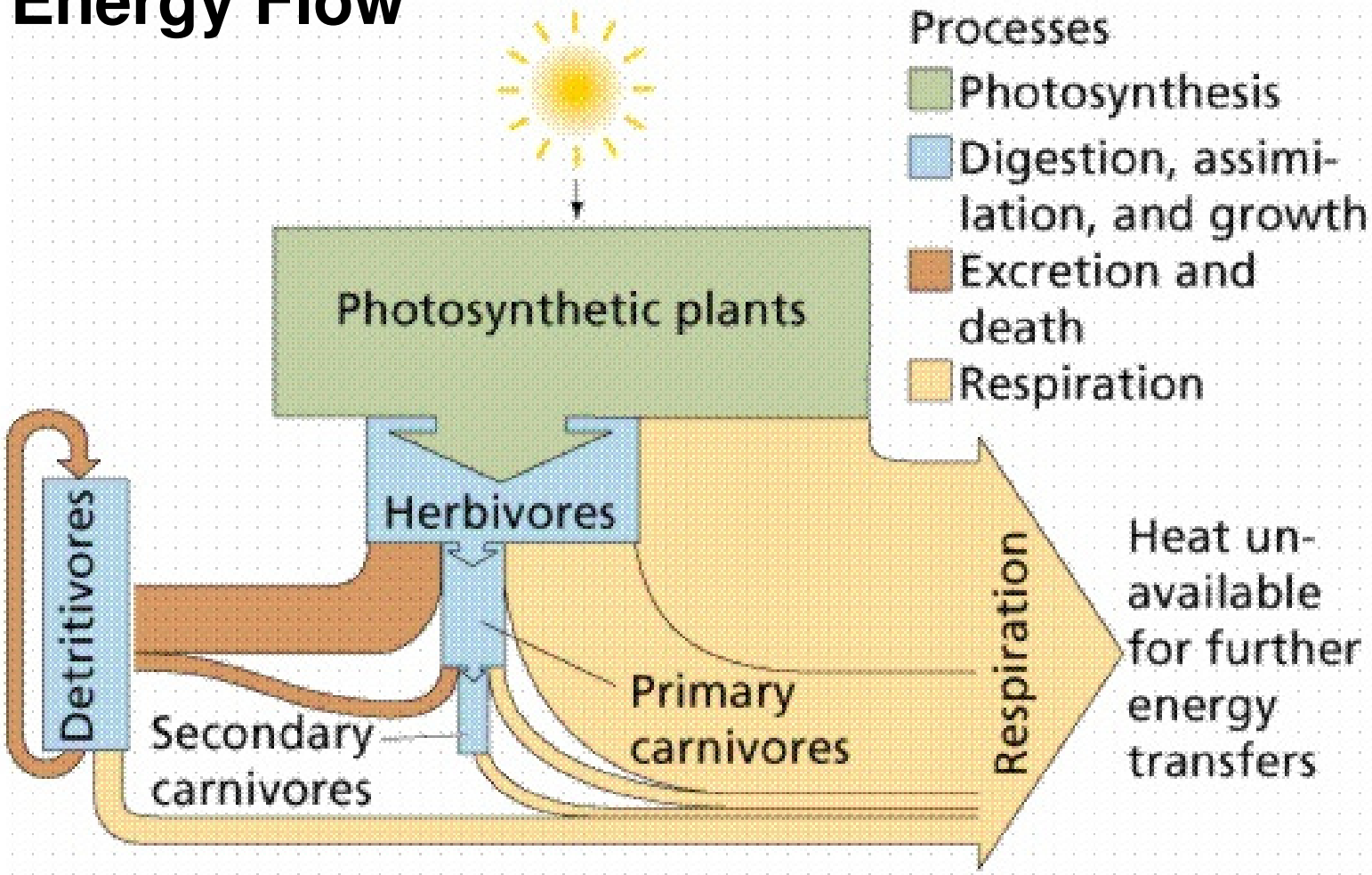
Functions of Ecosystem

1. Density (community)
2. Distribution (community)
3. Dominance (community)
4. Energy flow (ecosystem)
5. Biogeochemical cycle (ecosystem)

Ecosystem

P. Hw.

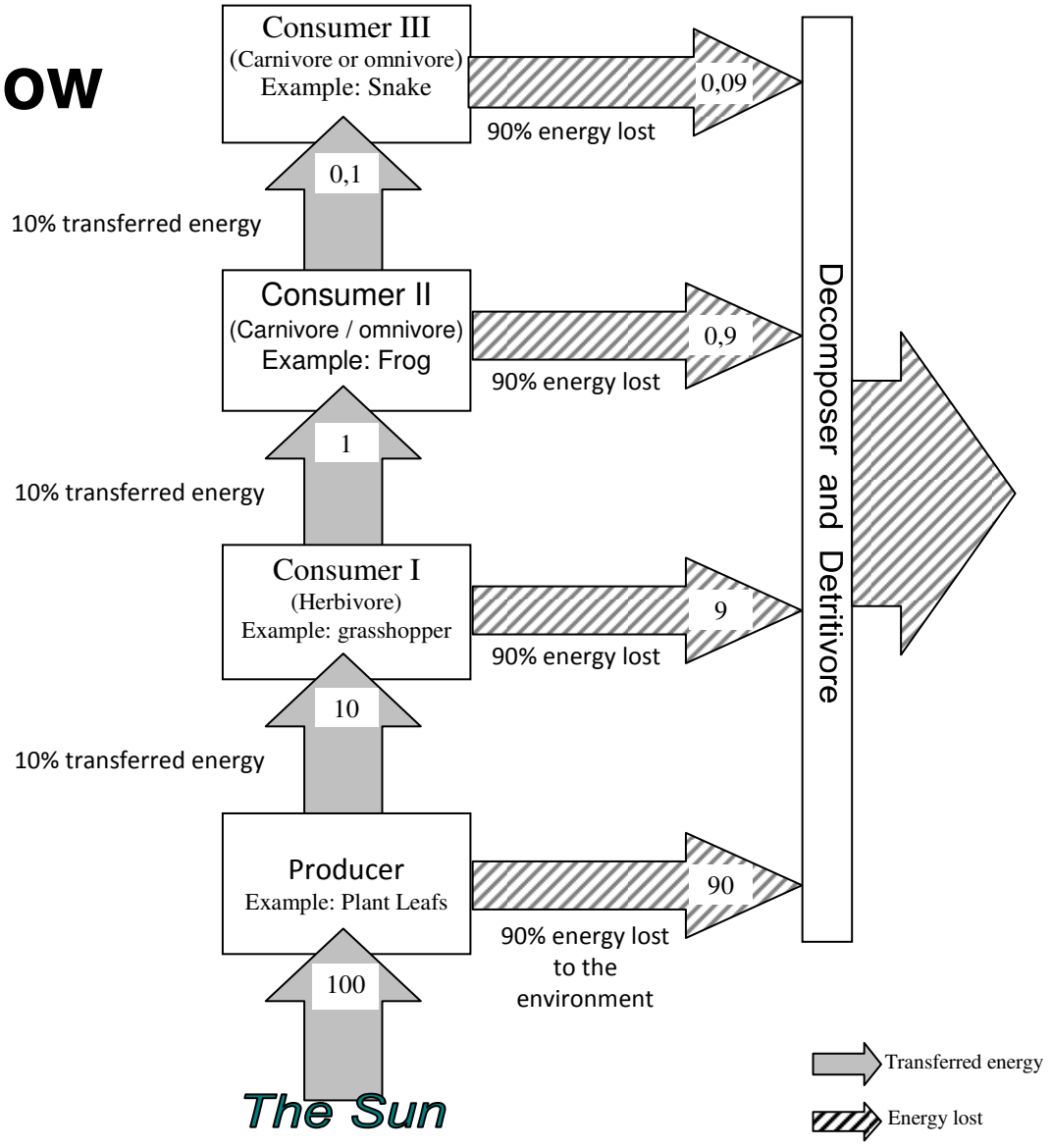
Energy Flow



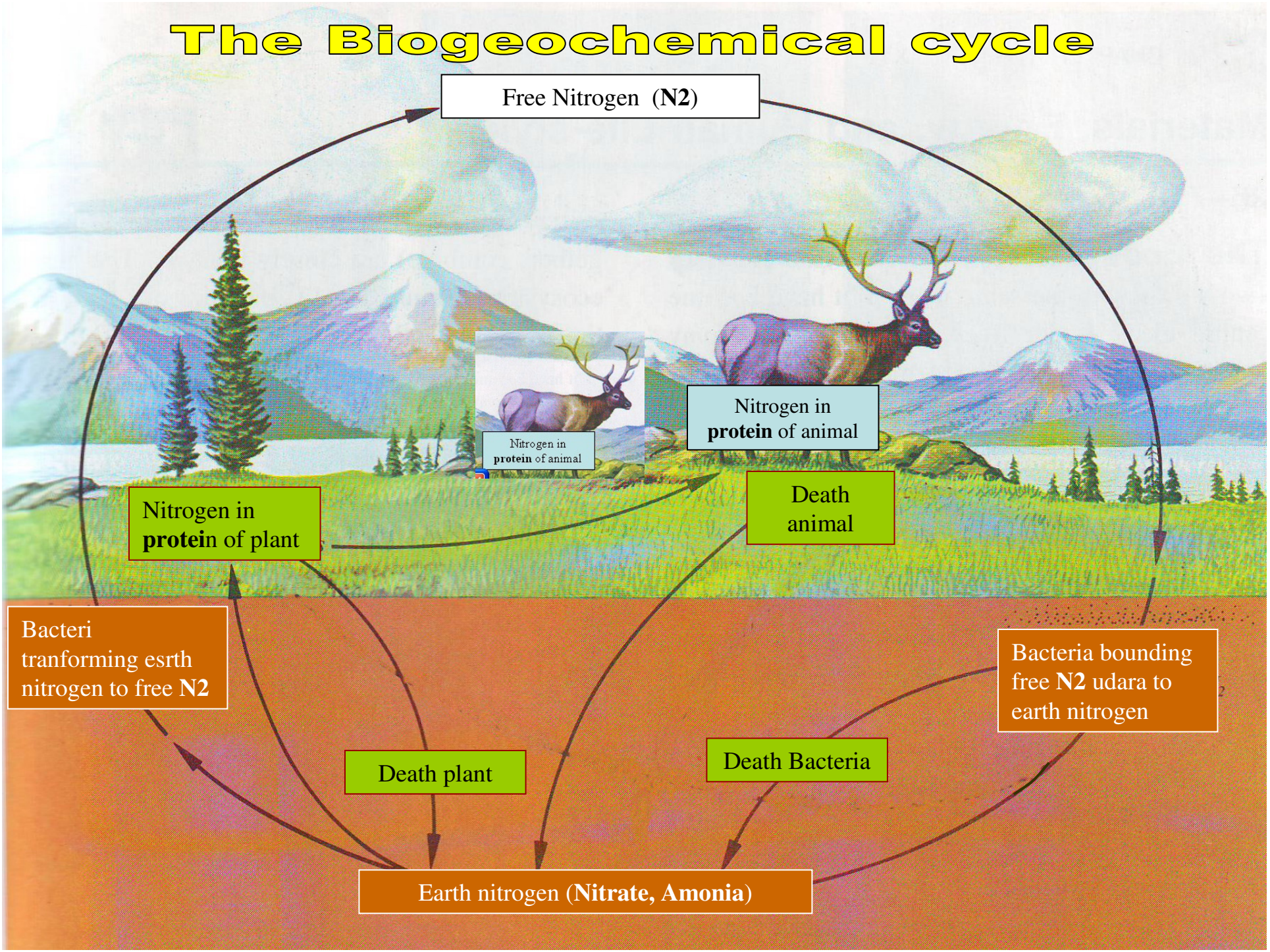
Ecosystem

P. Hw.

Energy Flow

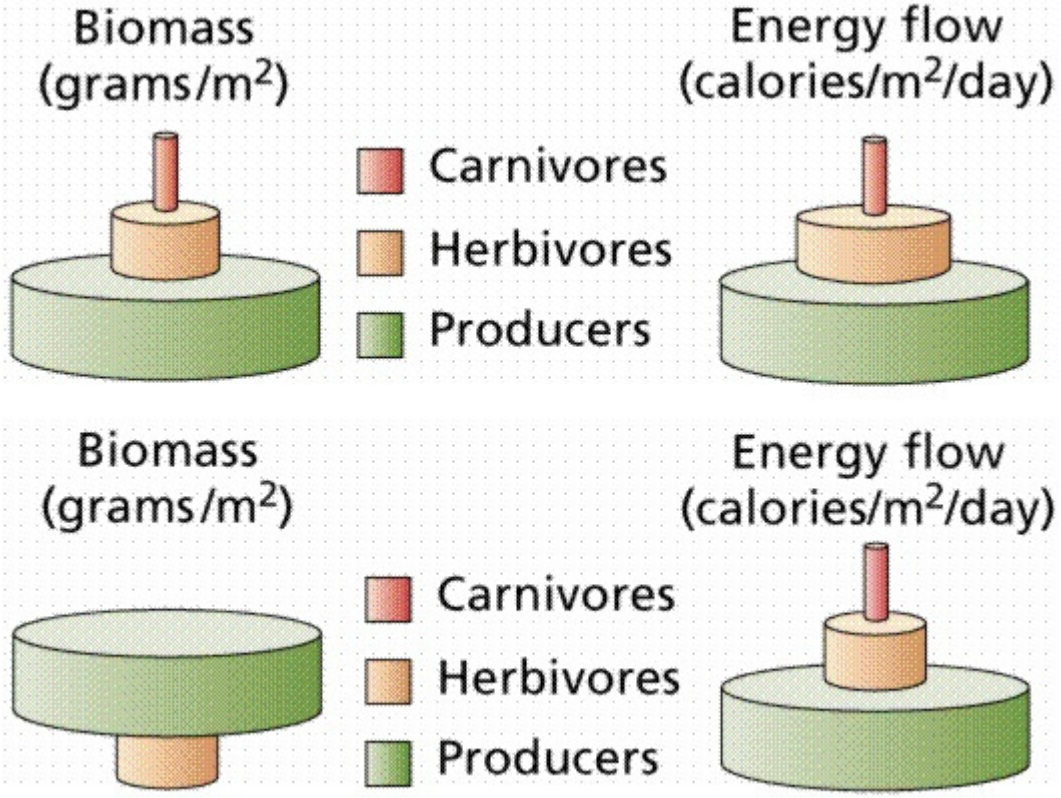


The Biogeochemical cycle



Ecosystem

Stability and Balance



REPRODUCTION & GENETICS

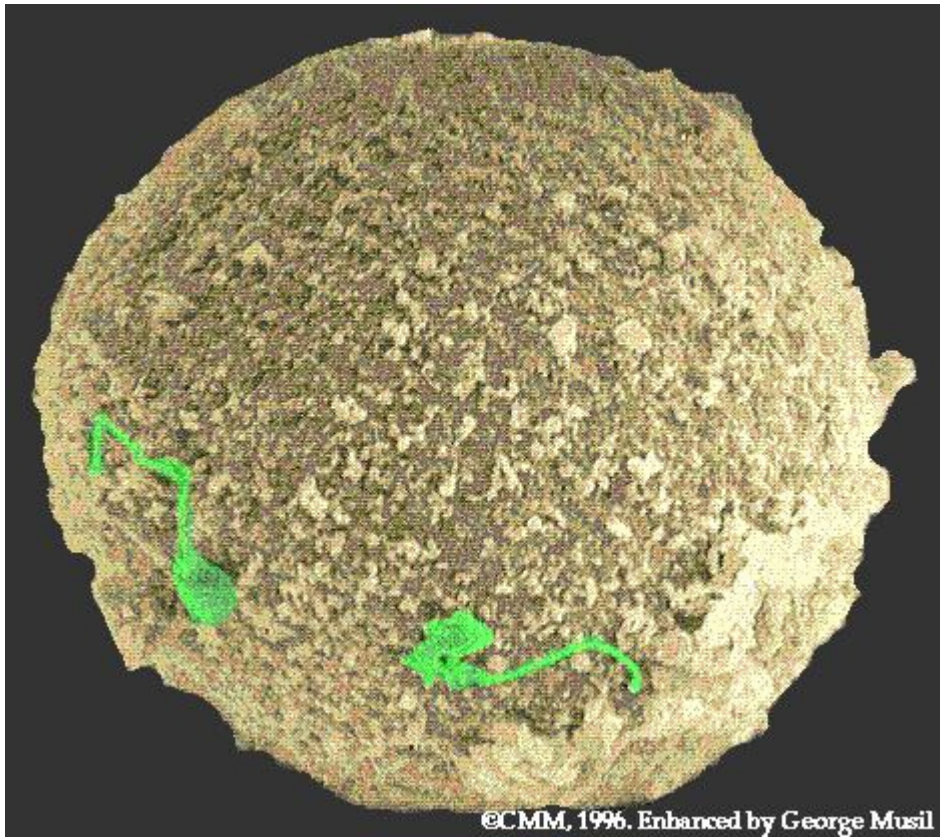
- Production again and again in similar condition
- Transfer some things (from parental to filial)
- The things are physical things not an attitude ones

Blending Theory

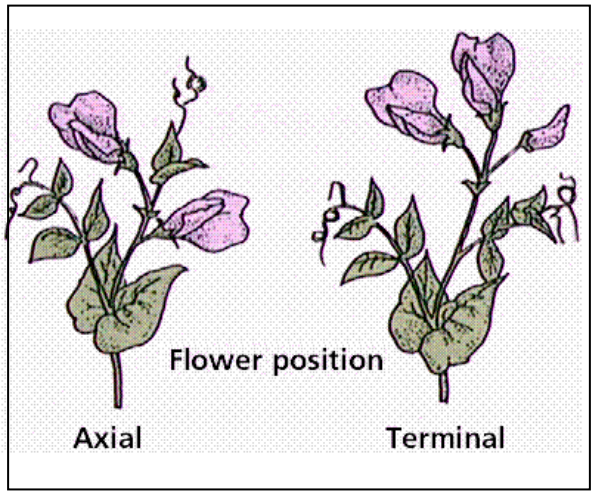
History toward Blending Theory

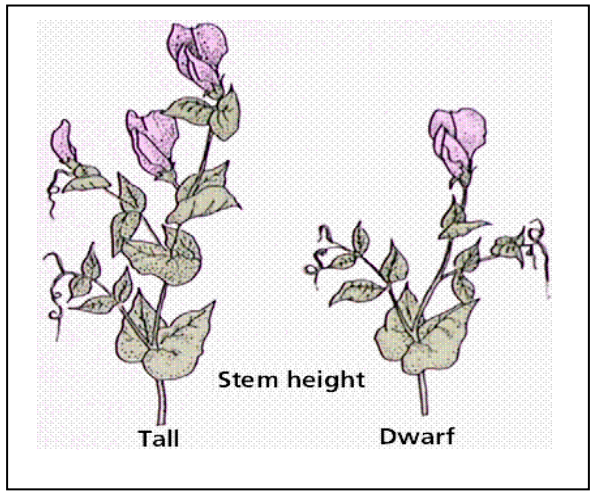
- Theophrastus (Ancient Greek) proposed that male flowers caused female flowers to ripen
- Hippocrates (Ancient Greek) speculated that "seeds" were produced by various body parts and transmitted to offspring at the time of conception
- Aristotle (Ancient Greek) thought that male and female semen mixed at conception
- Aeschylus, in 458 BC, proposed the male as the parent, with the female as a "nurse for the young life sown within her"
- During the 1700s, Dutch microscopist Anton van Leeuwenhoek (1632-1723) discovered "animalcules" in the sperm of humans and other animals
- Spermist (1800s) Some scientists speculated they saw a "little man" (homunculus) inside each sperm
- Ovists (1800s), believed that the future human was in the egg, and that sperm merely stimulated the growth of the egg. Ovists thought women carried eggs containing boy and girl children, and that the gender of the offspring was determined well before conception
- Blending theories of inheritance supplanted the spermists and ovists during the end of 19th century. The mixture of sperm and egg resulted in progeny that were a "blend" of two parents' characteristics. --- Mendelian

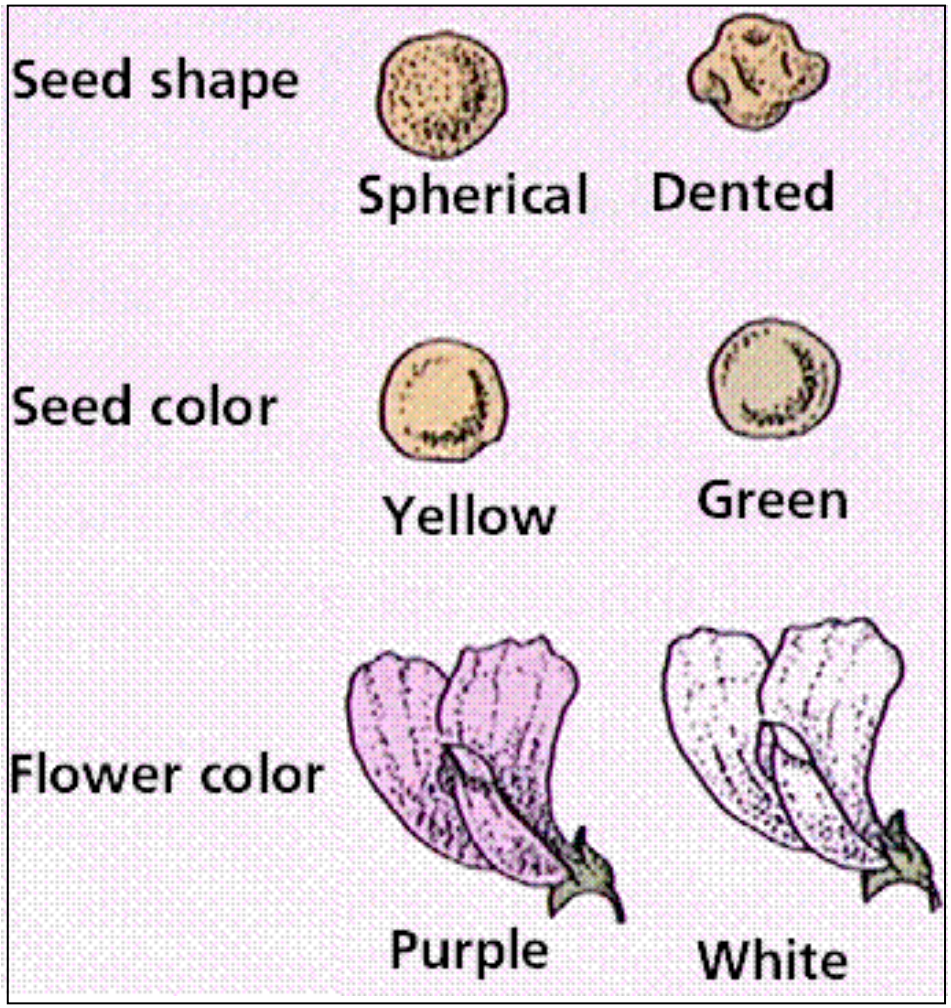
The Egg and Sperm



Blending Theory-Interbreeding







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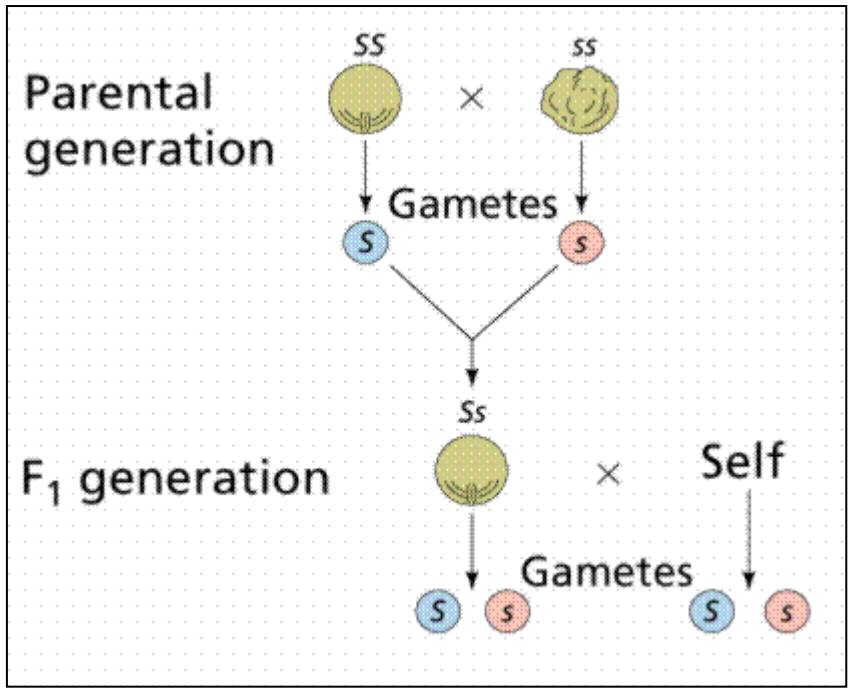
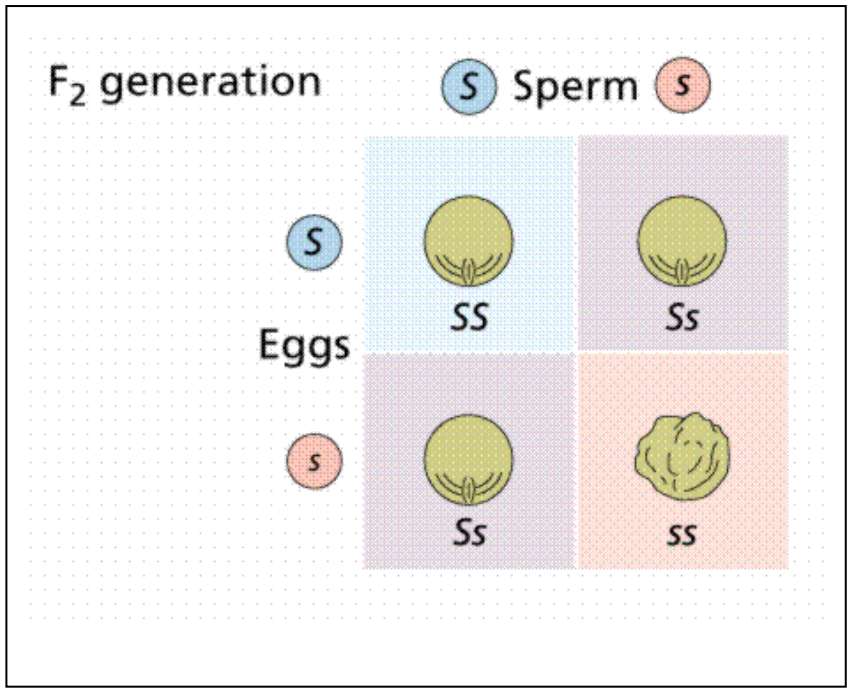
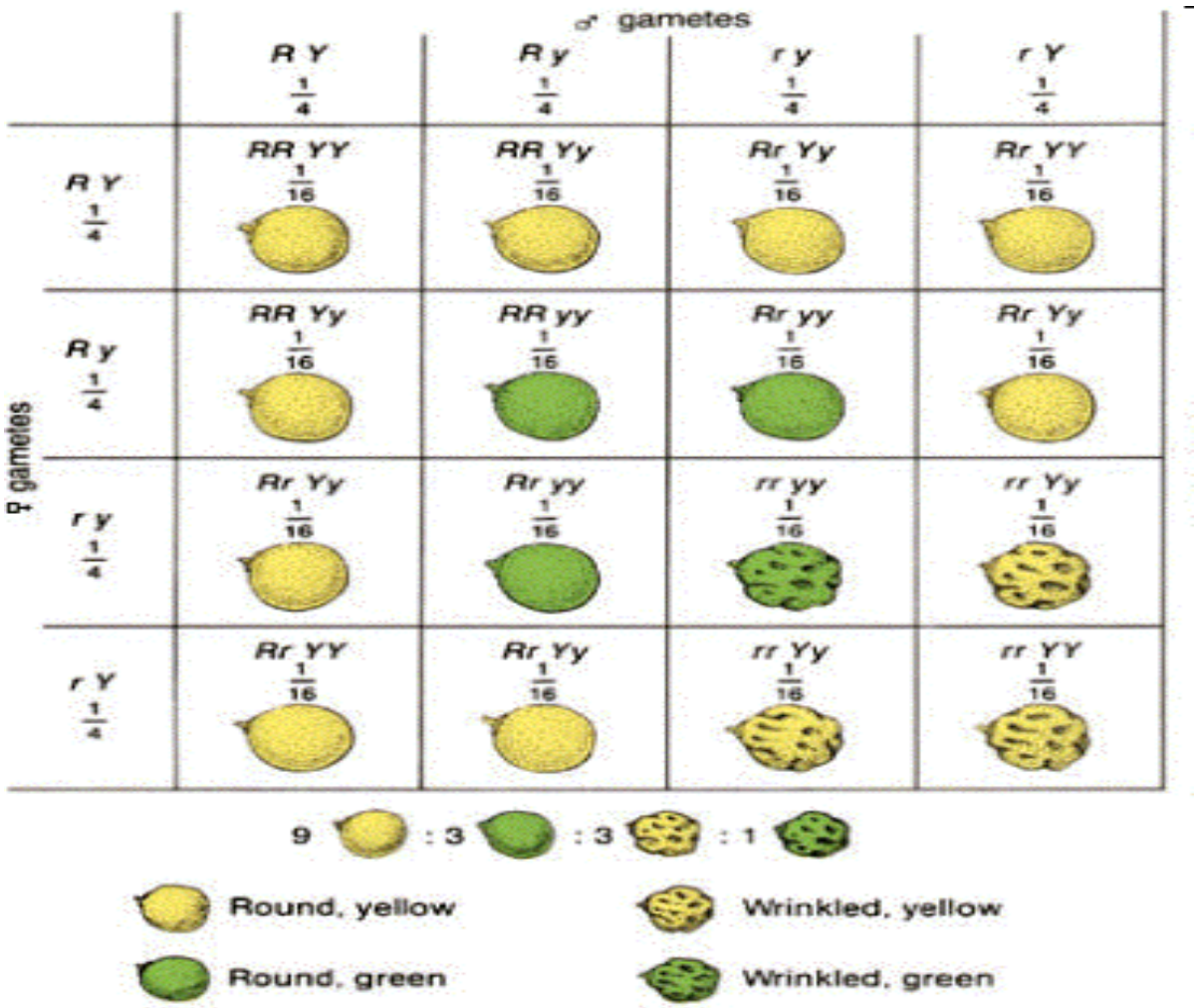




Di hybrid


♂ gametes
♀ gametes
R Y 1/4
R y 1/4
r y 1/4
r Y 1/4
RR YY 1/16
RR Yy 1/16
Rr Yy 1/16
Rr YY 1/16
RR Yy 1/16
RR yy 1/16
Rr yy 1/16
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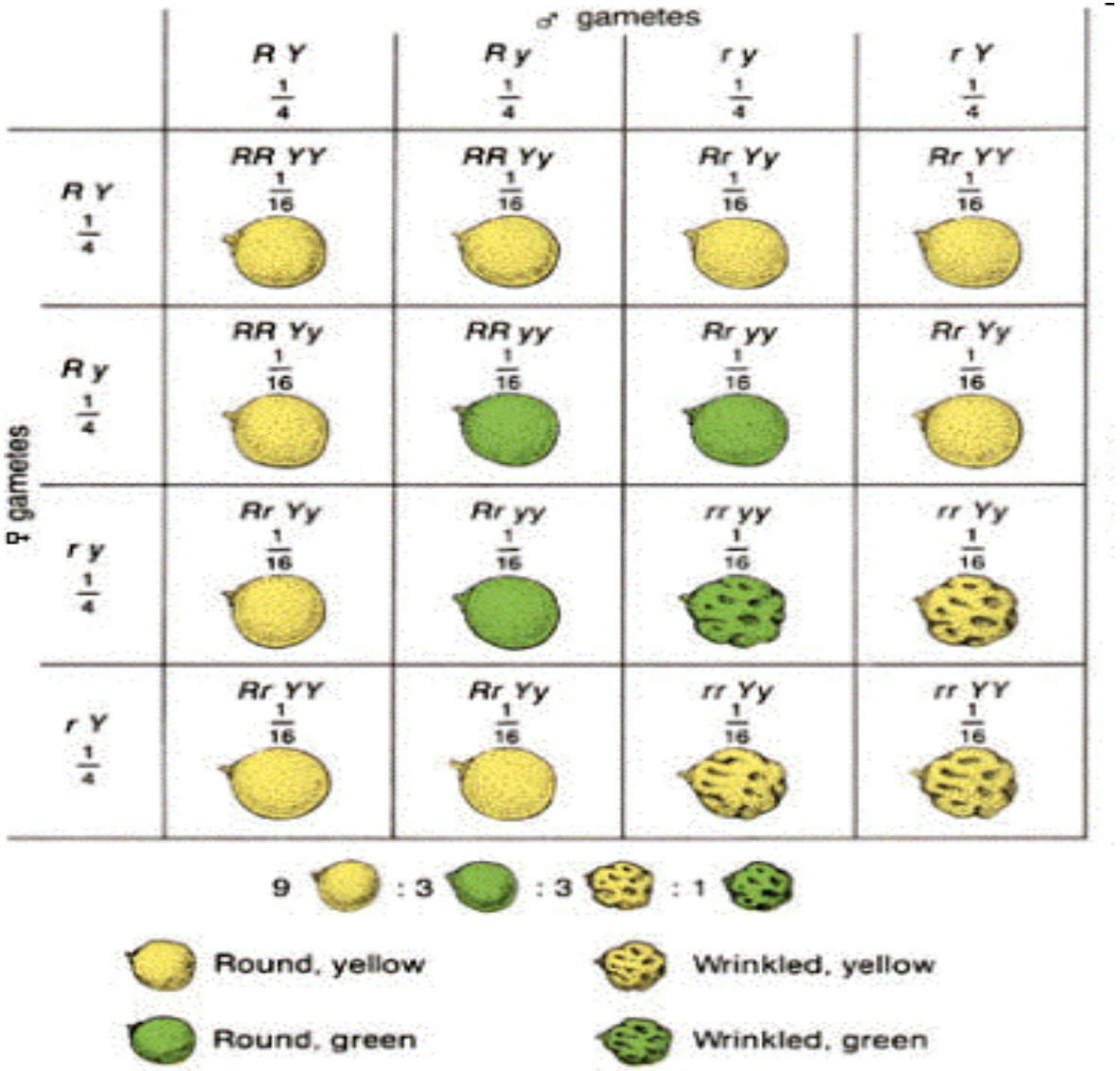
Rr yy 1/16
rr yy 1/16
rr Yy 1/16
Rr YY 1/16
Rr Yy 1/16
rr Yy 1/16
rr YY 1/16
9 : 3 : 3 : 1
Round, yellow
Round, green
Wrinkled, yellow
Wrinkled, green


♂ gametes
R Y 1/4
R y 1/4
r y 1/4
r Y 1/4
♀ gametes
R Y 1/4
RR YY 1/16
RR Yy 1/16
Rr Yy 1/16
Rr YY 1/16
R y 1/4
RR Yy 1/16
RR yy 1/16
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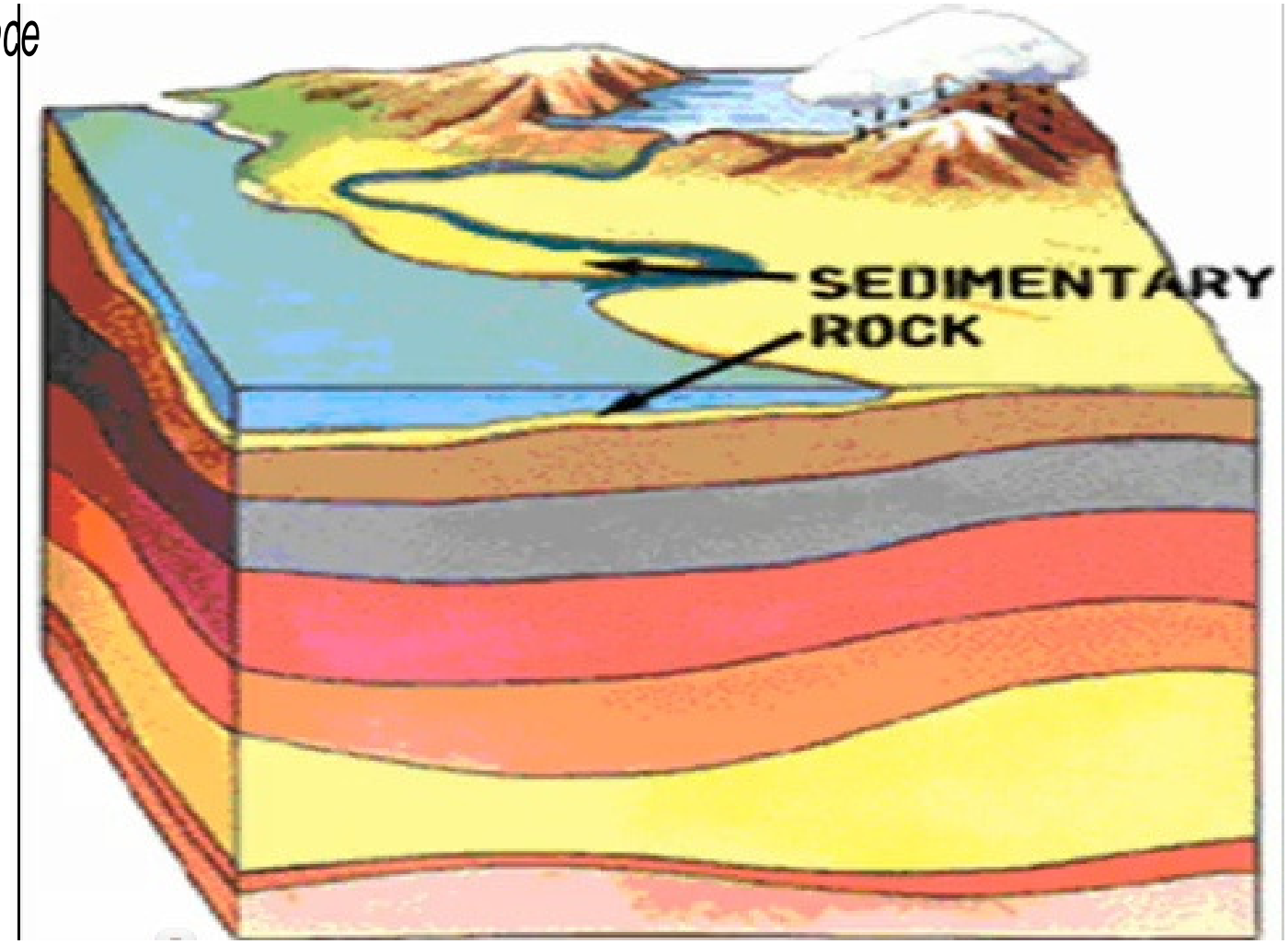
Rr Yy 1/16
r y 1/4
Rr Yy 1/16
Rr yy 1/16
rr yy 1/16
rr Yy 1/16
r Y 1/4
Rr YY 1/16
Rr Yy 1/16
rr Yy 1/16
rr YY 1/16
9 : 3 : 3 : 1
Round, yellow
Wrinkled, yellow
Round, green
Wrinkled, green

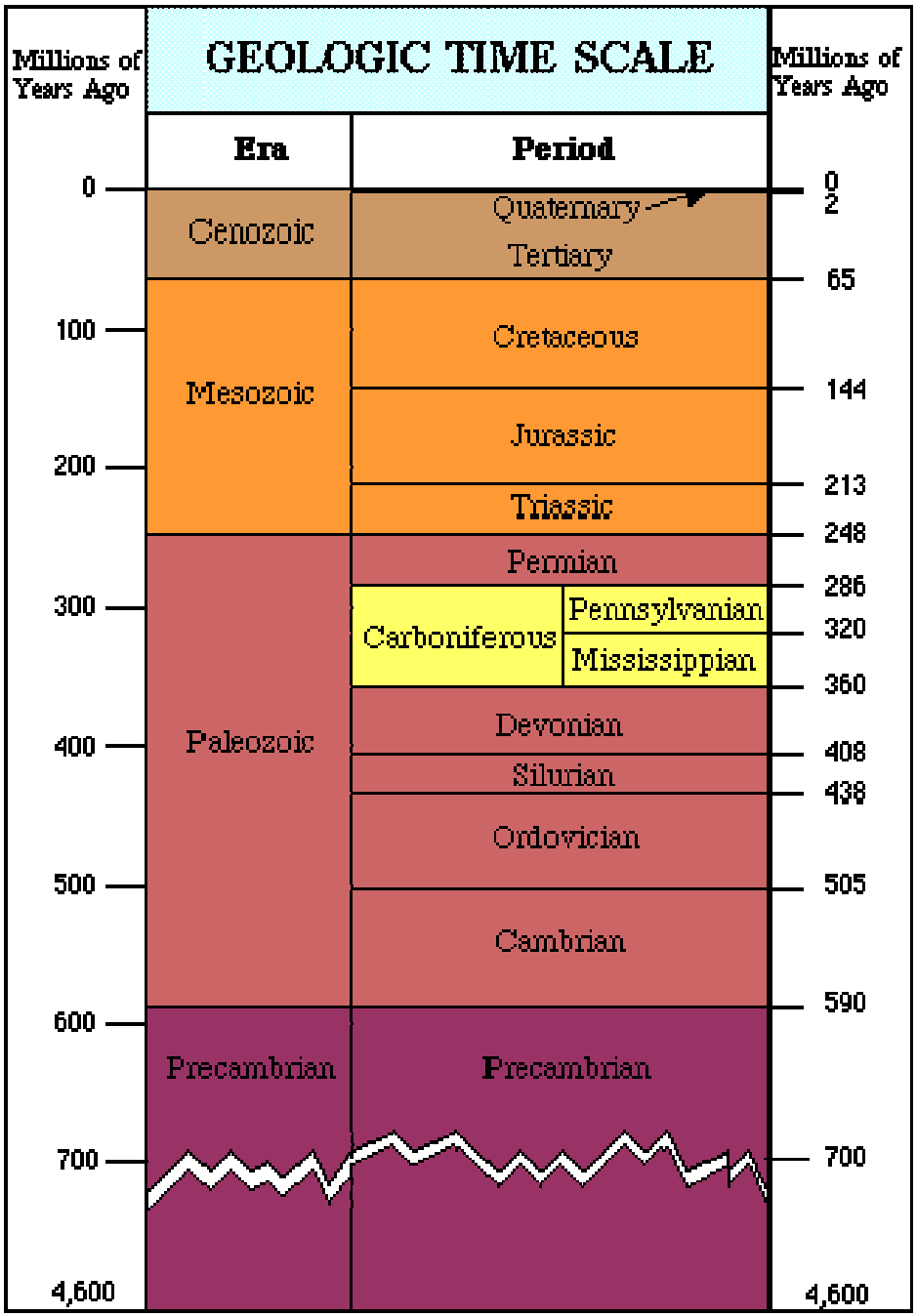
Evolution

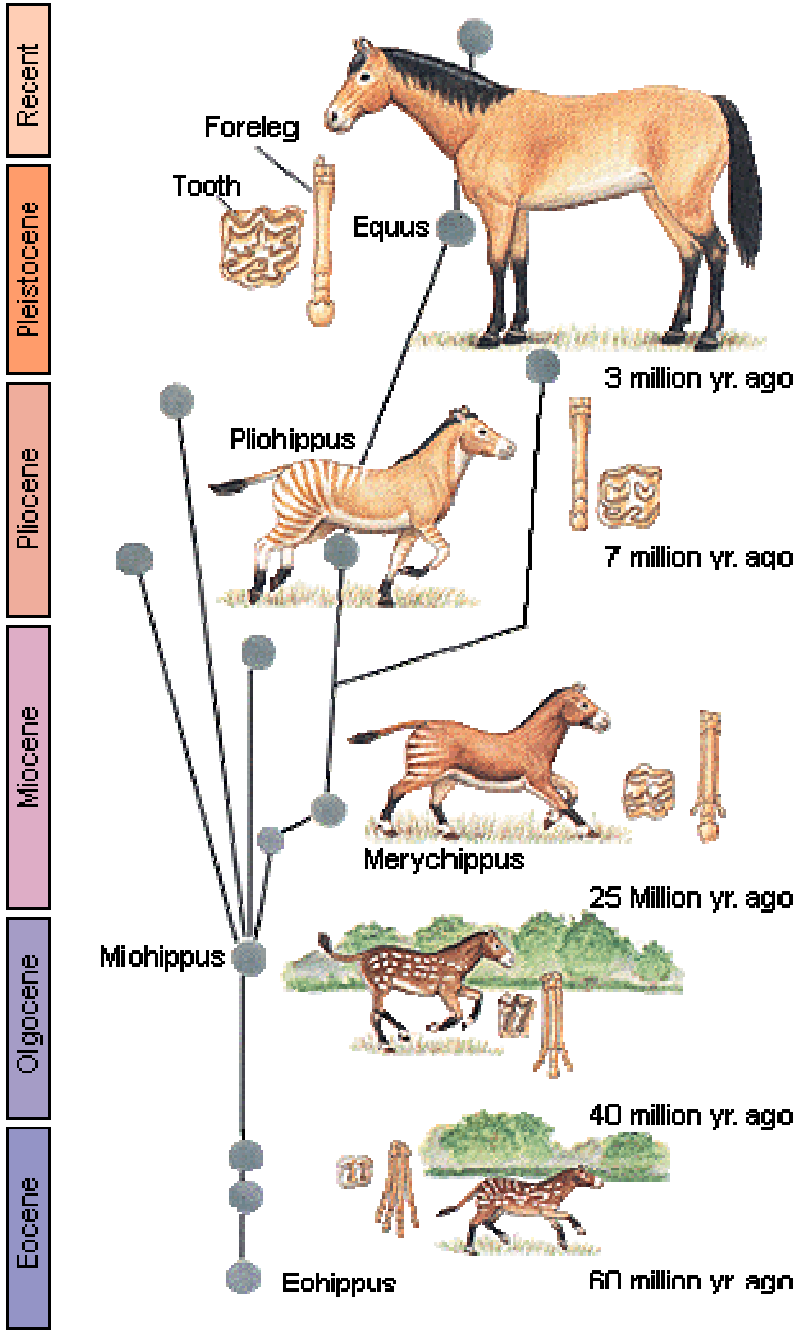
Charles Lyell

Alfred Russel Wallade

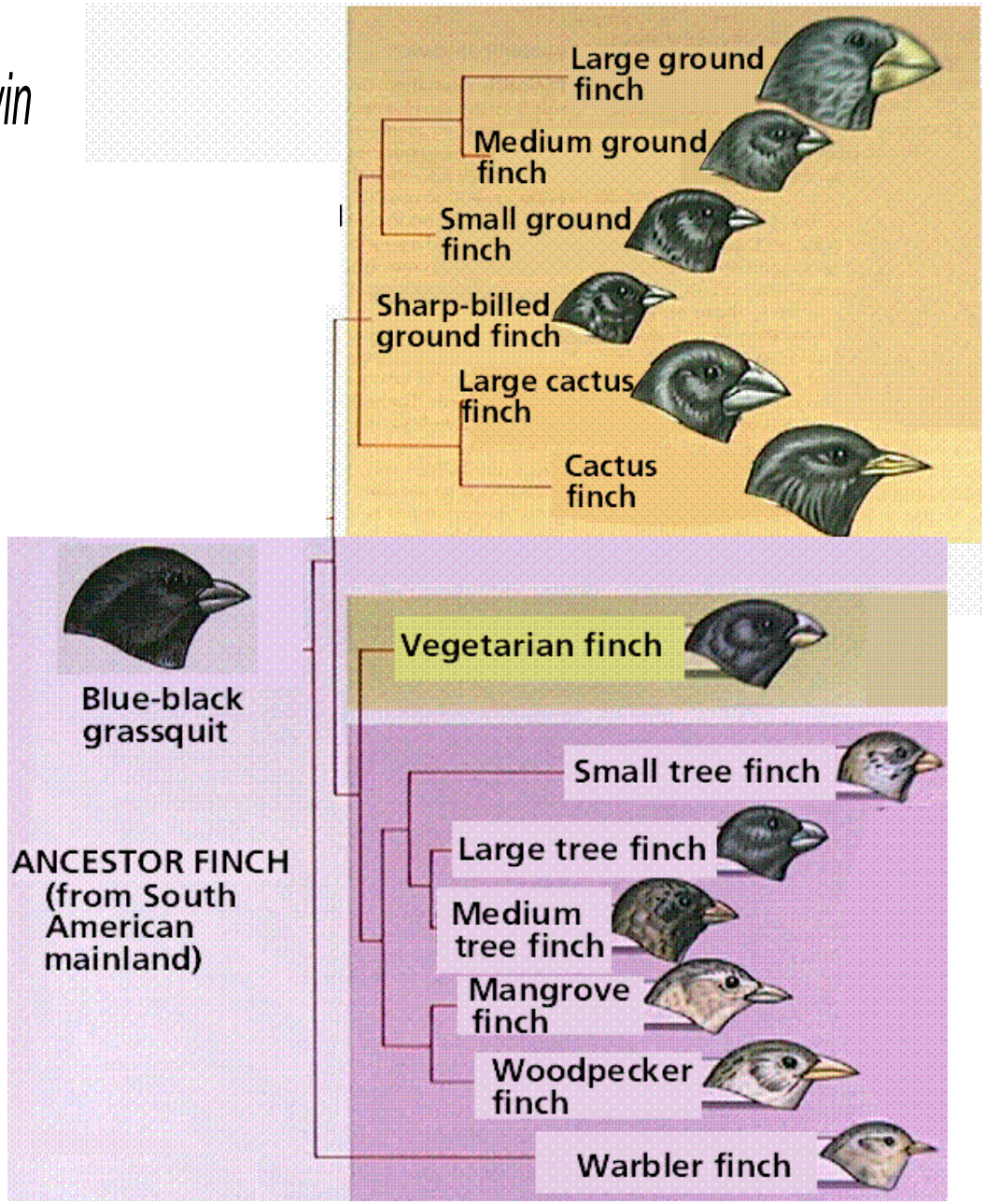


Charles Lyell

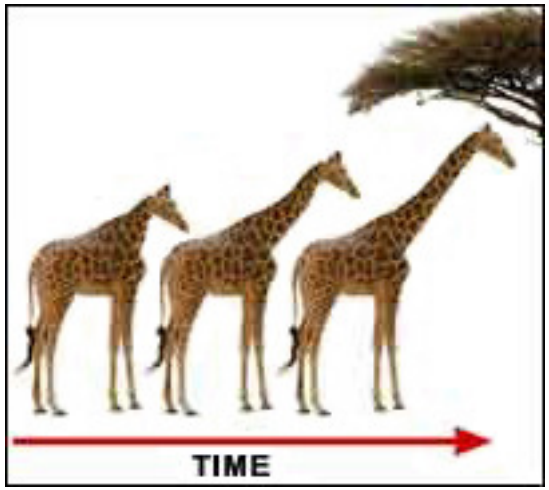

GEOLOGIC TIME SCALE
Millions of Years Ago
Era
Period
Millions of Years Ago
0
Cenozoic
Quaternary
2
Tertiary
65
End of the Dinosaurs
100
Mesozoic
Cretaceous
144
Jurassic
200
213
First Dinosaurs, Mammals, Birds
Triassic
248
Permian
286
300
Pennsylvanian
320
Carboniferous
Mississippian
First Reptiles
360
First Amphibians
Devonian
400
Paleozoic
408
Silurian
438
Ordovician
First Land Plants
500
505
First Fishes
Cambrian
590
600
Precambrian
Precambrian
700
700
First Invertebrates
4,600
4,600

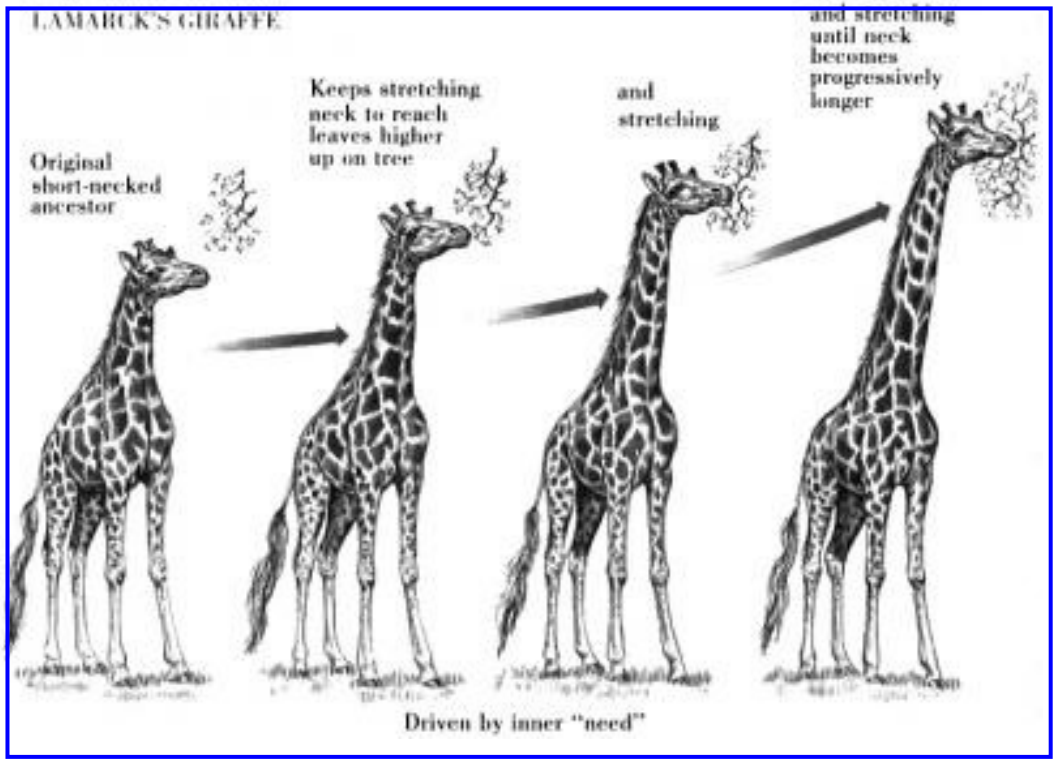

Recent
Pleistocene
Pliocene
Miocene
Oligocene
Eocene
Foreleg
Tooth
Equus
3 million yr. ago
Pliohippus
7 million yr. ago
Merychippus
25 Million yr. ago
Miohippus
40 million yr. ago
Eohippus
60 million yr. ago

Charles Darwin

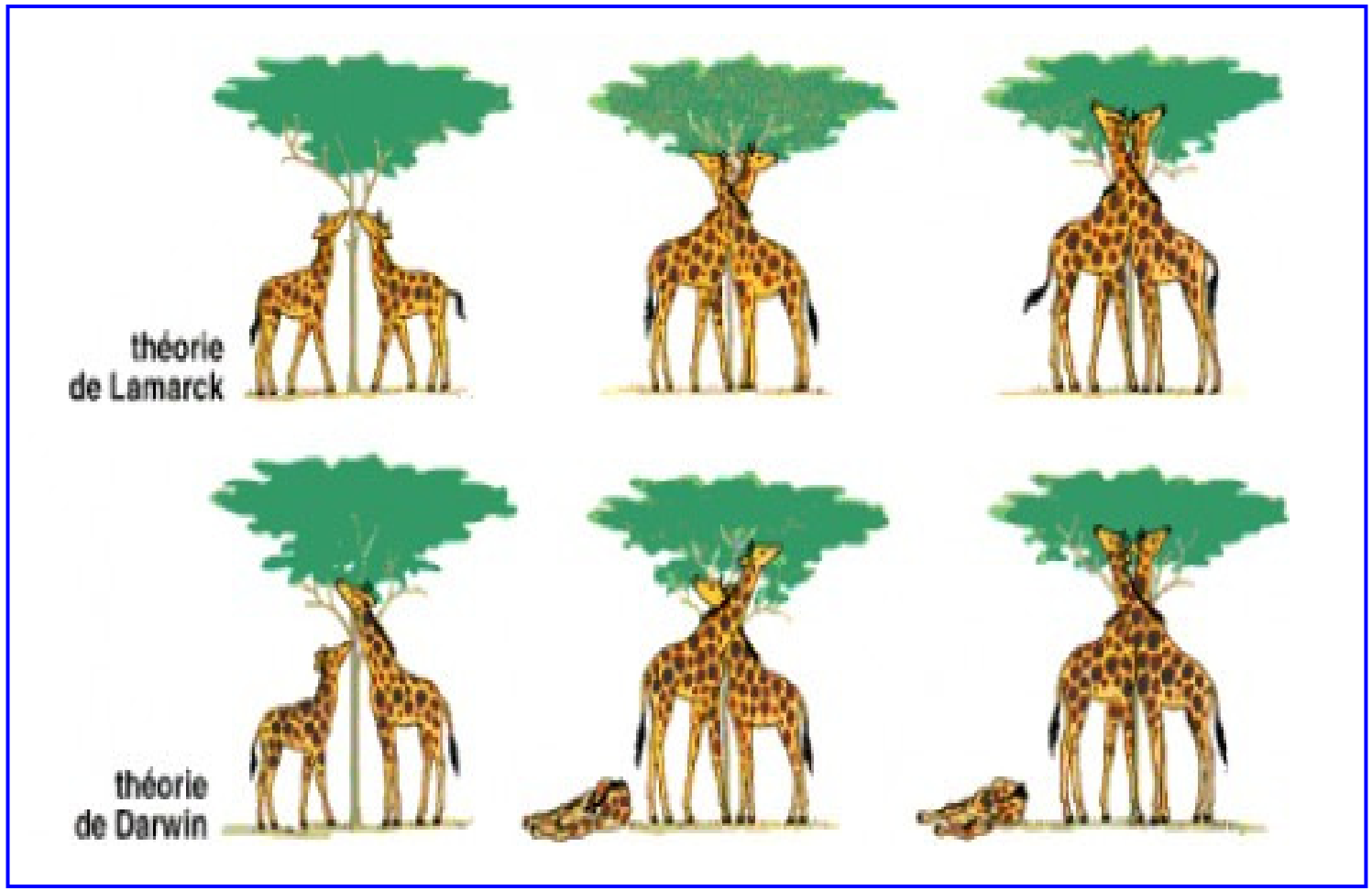


J.B Lamarck


TIME

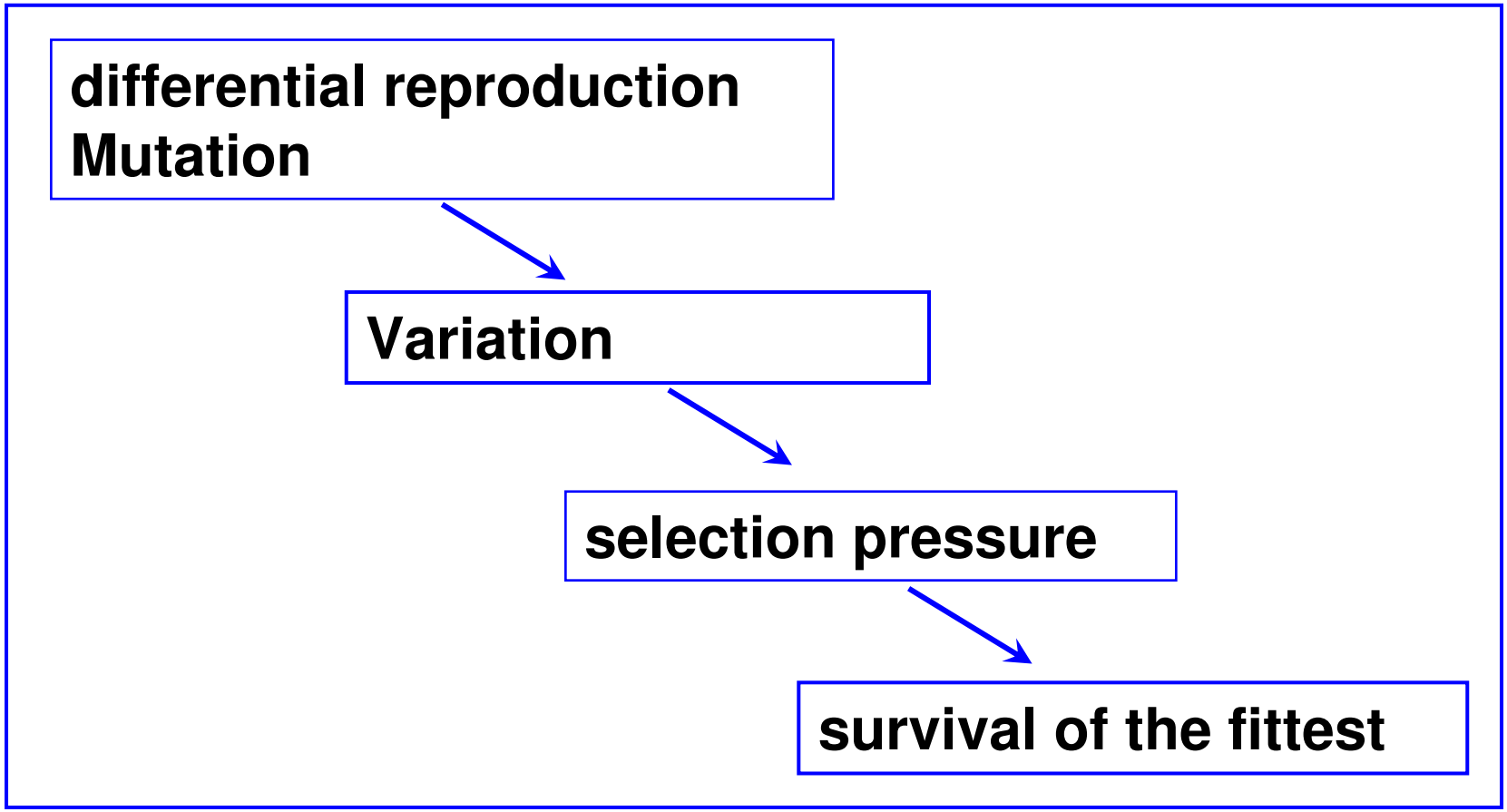

LAMARCK'S GIRAFFE
Original short-necked ancestor
Keeps stretching neck to reach leaves higher up on tree
and stretching
and stretching until neck becomes progressively longer
Driven by inner "need"

Darwinism vs Lamarckism



Darwin's Theory:
"The Origin of Species by Means Natural Selection"

Mechanism

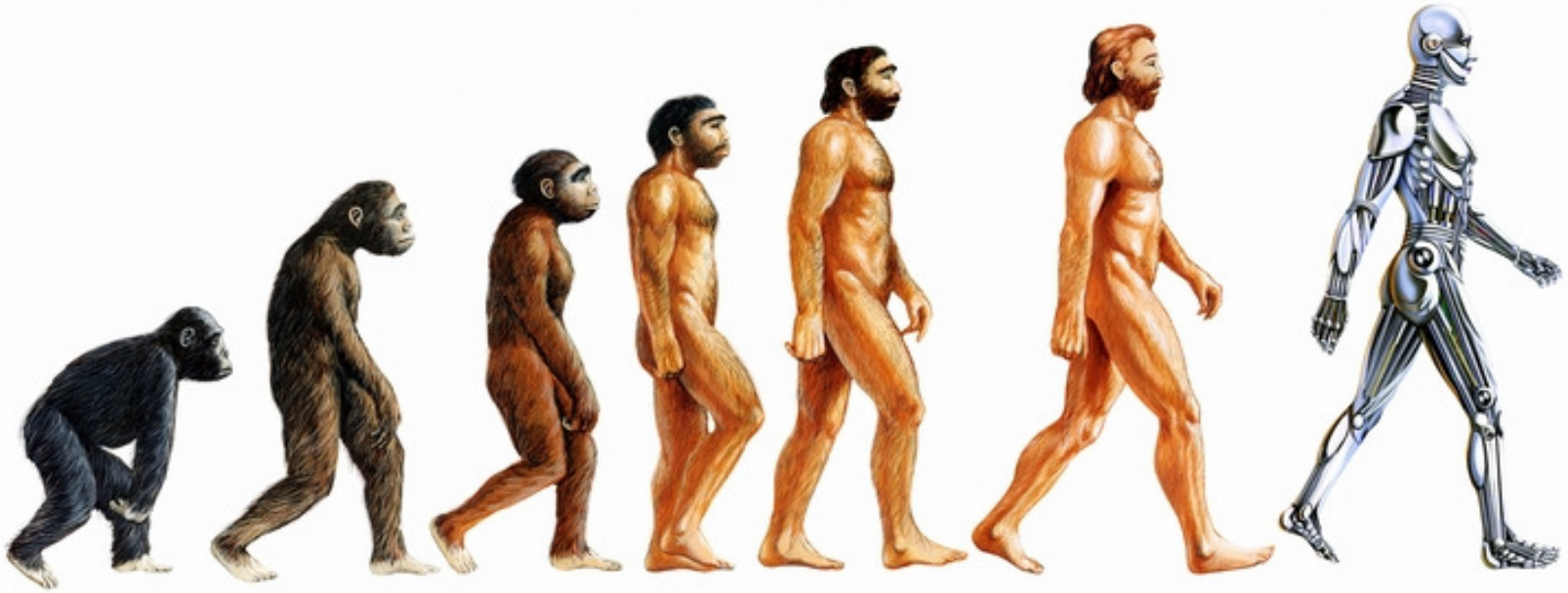


Evolution

Between Idea & Fact

P. Hw.

Idea:



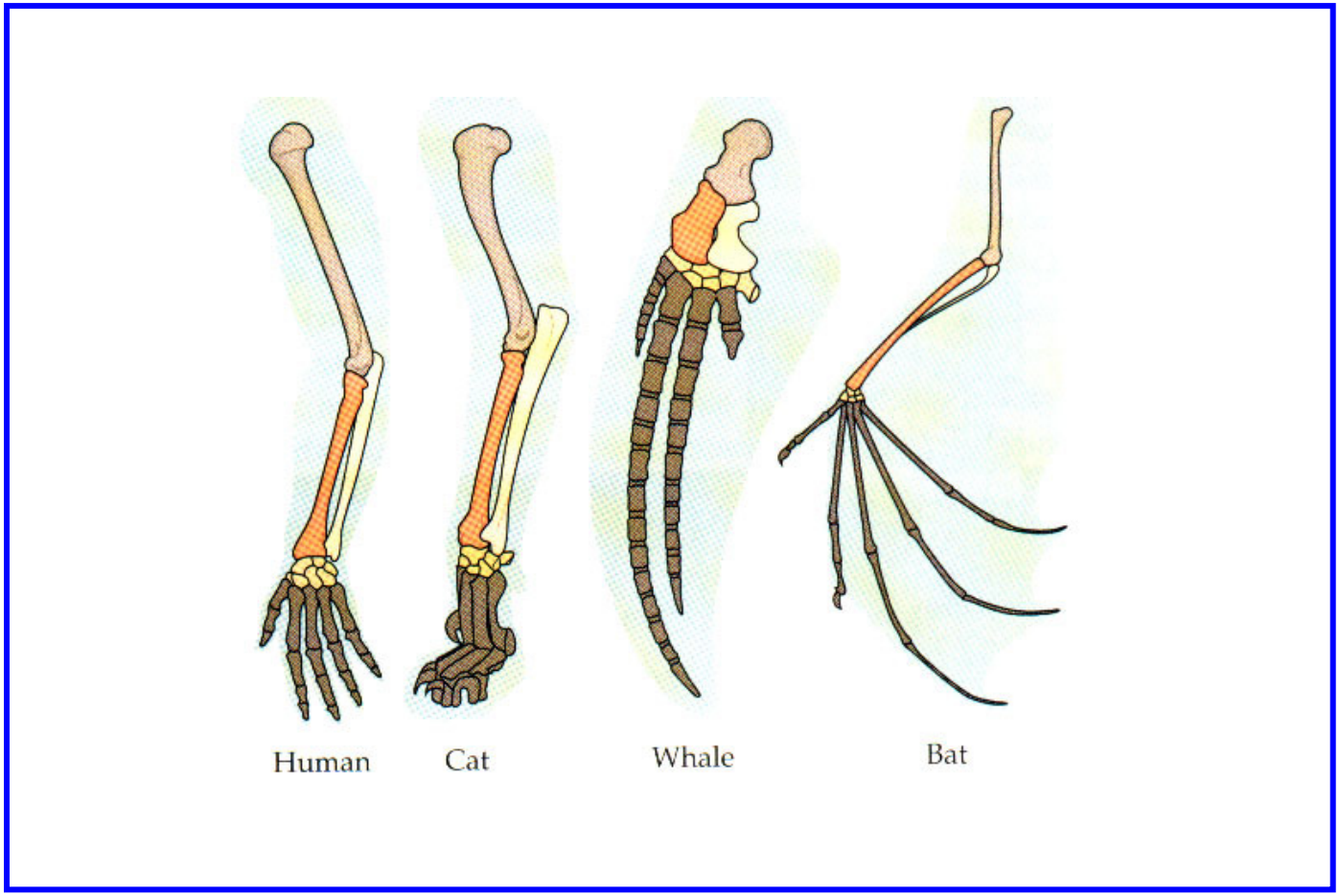
Evolution Between Idea & Fact

P. Hw.

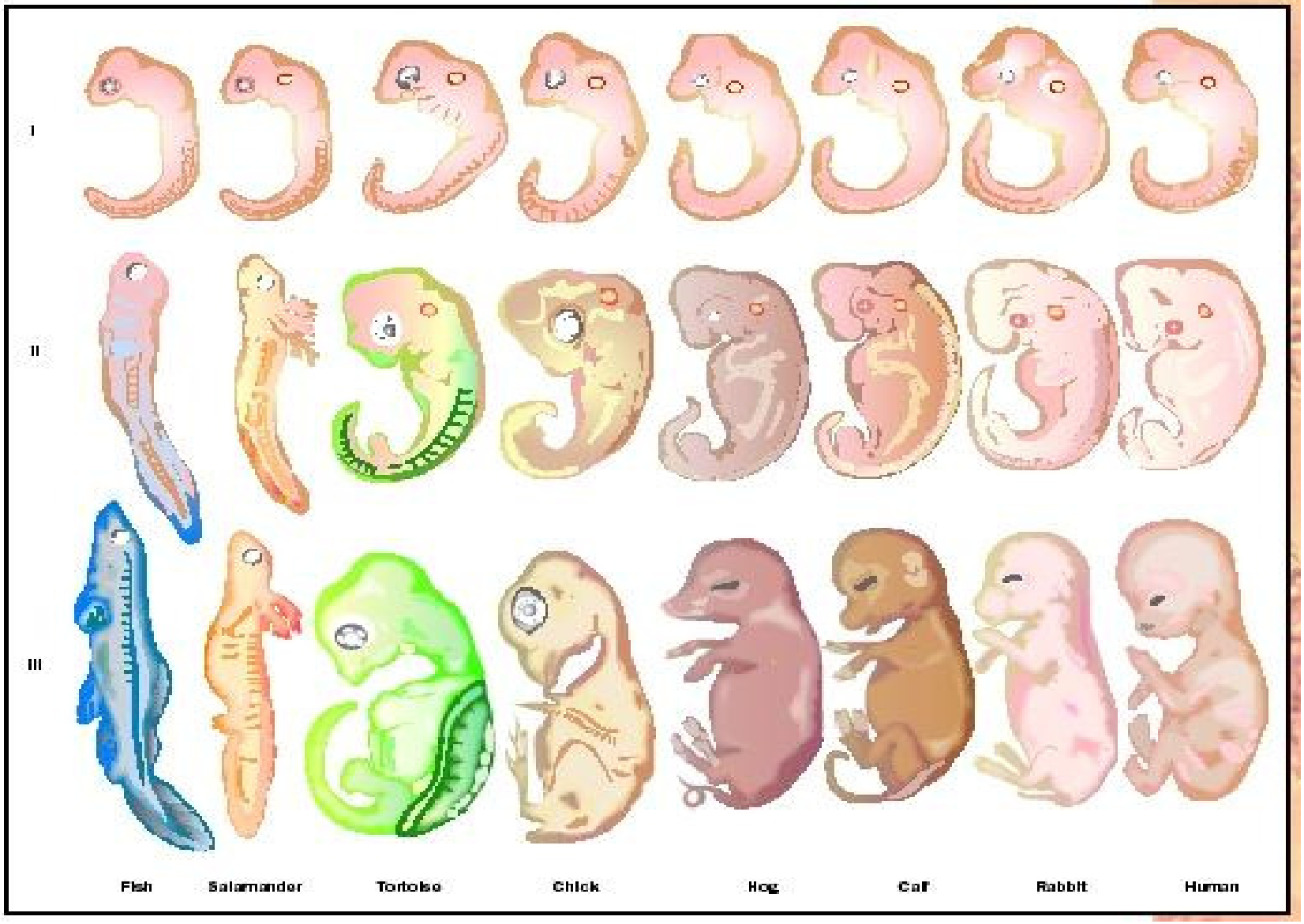
Facts: Evidences or clues

- Fossil evidence
- Morphology comparative
- Anatomy comparative
- Embryology comparative
- Biochemistry comparative

Anatomy Comp

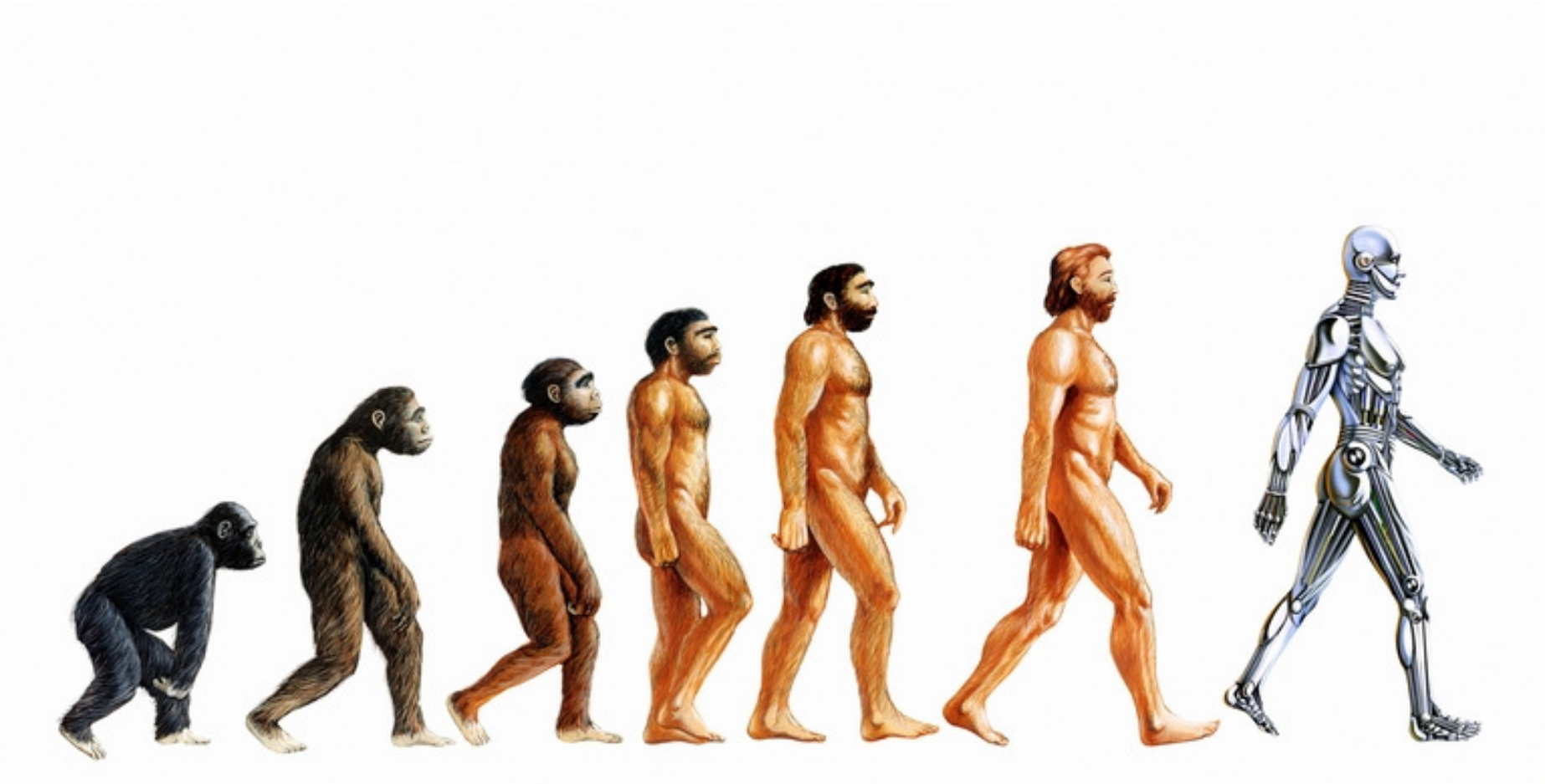


Embryology Comp



Organism	Number of differences in amino acid sequence compared to human haemoglobin
Gorilla (mammal)	1
Gibbon (mammal)	3
Squirrel monkey (mammal)	9
Mouse (mammal)	27
Chicken (bird)	45
Frog (amphibian)	67
Fish	200

Pro-Contr



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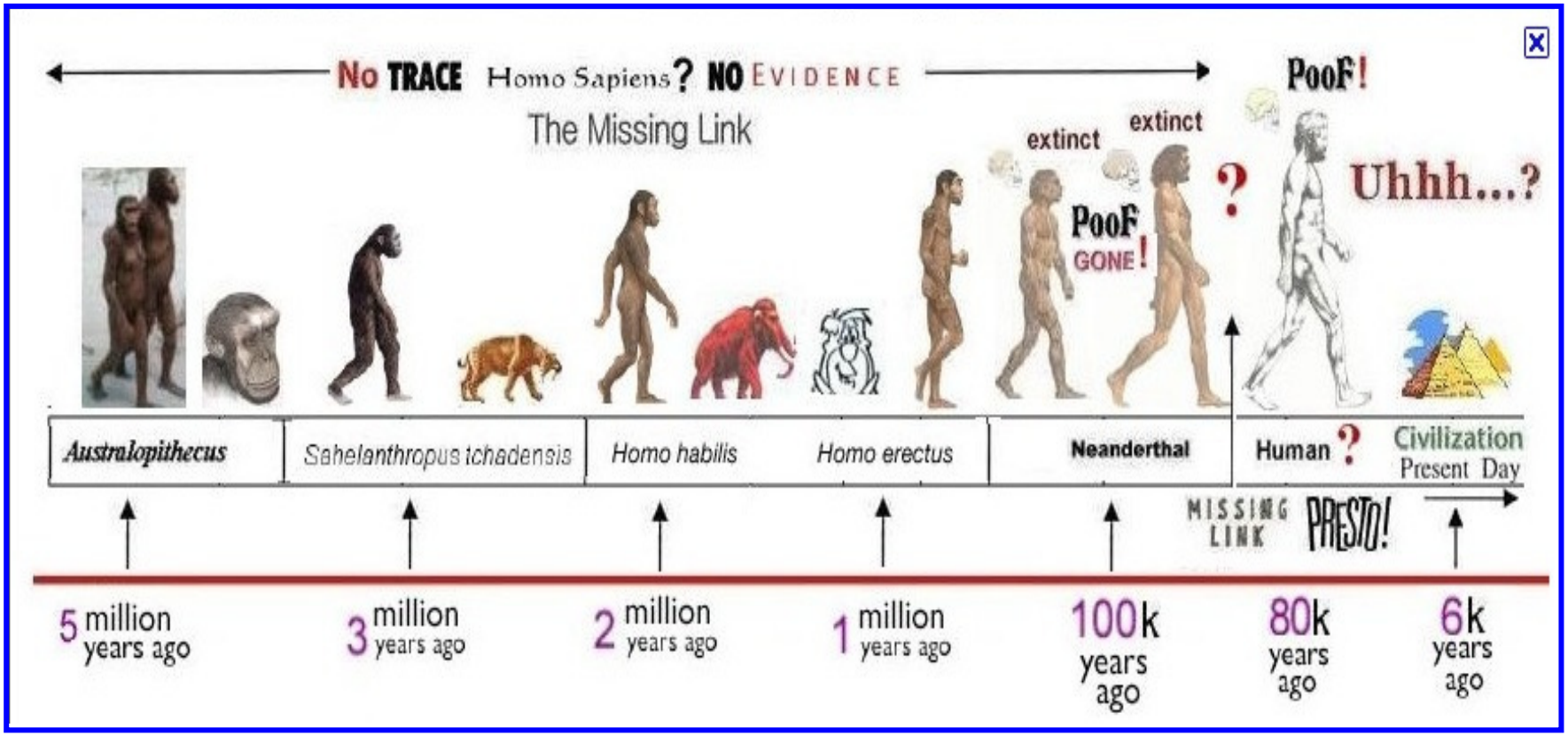

Evolution vs Religion

Evolution vs Special Creation

Paidi Hw.

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