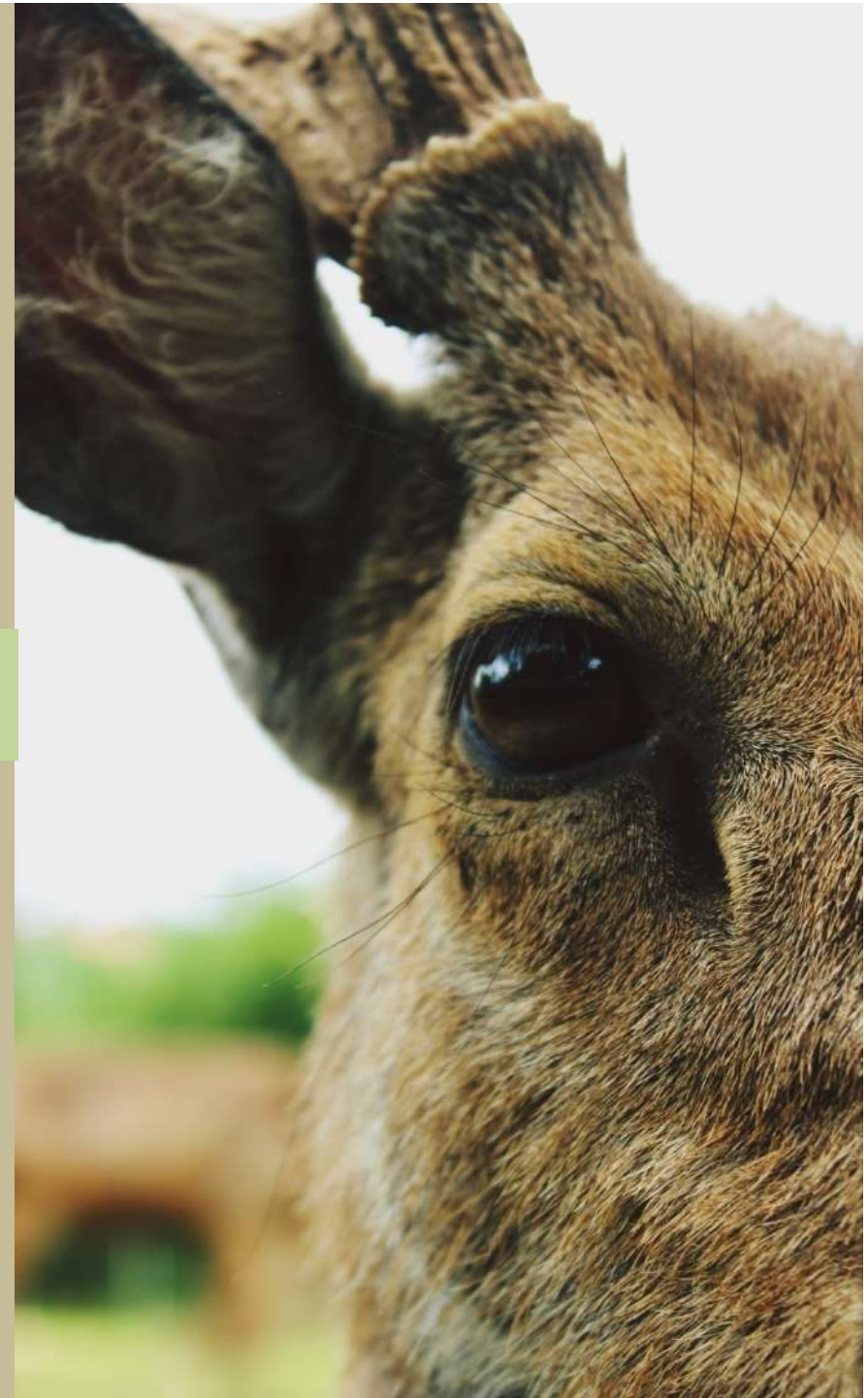


TAKSONOMI HEWAN

CHAPTER 1: APERSEPI

Husni Mubarak, S.Pd., M.Si.
Tadris Biologi
IAIN Jember



Outline Mata Kuliah

Nama MK : TAKSONOMI HEWAN

Kode MK : BIO15320

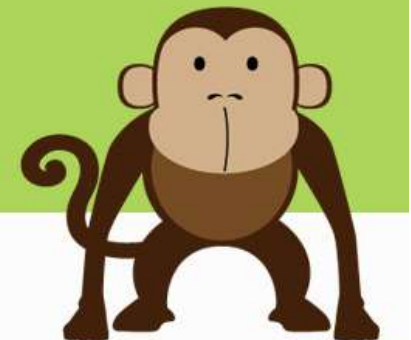
Jml SKS : 3 SKS

Semester : 6 (Genap)

Prodi : Tadris Biologi

Kel. MK : Komp.Utama Prodi

Dosen : Husni Mubarak, S.Pd., M.Si





Deskripsi Mata Kuliah

MK ini membahas dasar-dasar klasifikasi, taksonomi, determinasi, *binomial nomenclatur*.

Karakteristik umum & khusus **morfologi, fisiologi & embriologi** serta **peranannya** bagi kehidupan manusia mulai Phylum, Classis, Ordo, Familia, Genus, Spesies. Mulai Phylum **Protozoa s/d Ecnodermata** (Invertebrata) & **Chordata s/d Mamalia** (Vertebrata).

Pertemuan	Materi
I	Overview Perkuliahan dan Kontrak Belajar; Apersepsi
II	Protozoa
III	Porifera
IV	Cnidaria, Ctenophora, Placozoa
V	Platyhelminthes
VI	Nematoda & Annelida
VII	Mollusca
VIII	UTS (Ujian Tengah Semester)
IX	Echinodermata
X	Arthropoda
XI	Chordata
XII	Pisces
XIII	Amphibia
XIV	Reptilia
XV	Aves
XVI	Mamalia
XVII	UAS (Ujian Akhir Semester)

Evaluasi

Ujian Tengah Semester	20%
Ujian Akhir Semester	40%
Tugas-Tugas	40%



**You've Already Knew My Style
How I Evaluate Your Work ^^**



Referensi

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Kontrak Perkuliahahan

- Batas keterlambatan? ? **15 menit**
- Absent (Alpha) > 3 kali → **Tidak boleh Ujian**
- Izin sakit → Surat Keterangan Dokter/ Puskesmas/ Klinik
- **SADAR** atas **KEWAJIBAN**, bukan hanya haknya
- **Sopan** dan **Santun (Anda Sopan, Saya Segan ^^)**
- Keberatan/ Pertanyaan/ Unek2 → Kritik membangun/
Silahkan menemui secara personal/ Sopan dan santun

Taxonomy – Whats it??

- Branch of Biology, dealing with **Identification**, **Naming** and **Classification** of organisms

- **Taxa** or **Takson**??

Taxon (plural Taxa)

Any unit used in the science of biological classification, or taxonomy. Taxa are arranged in a hierarchy from kingdom to subspecies

Siapa itu Taxonomist?



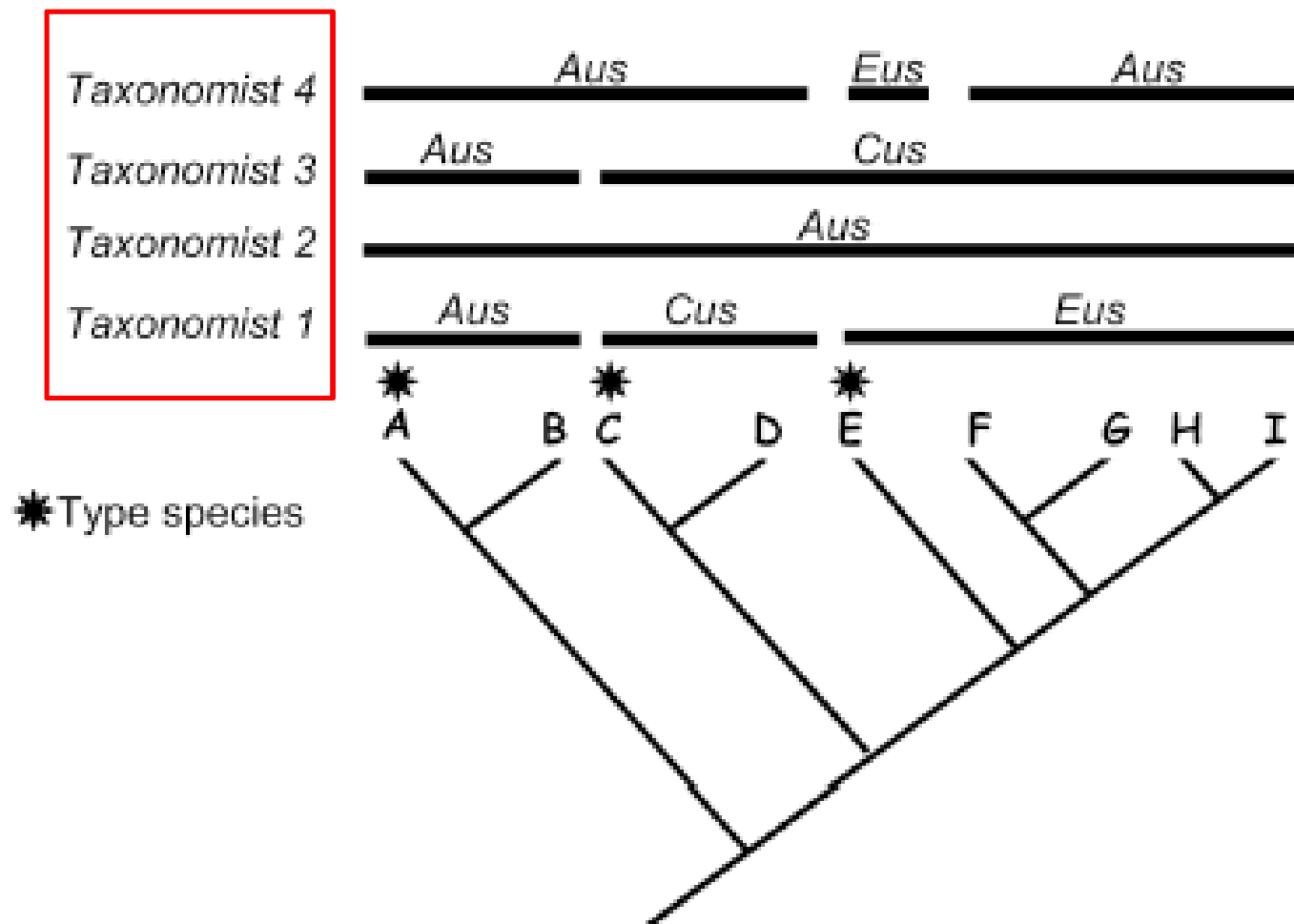
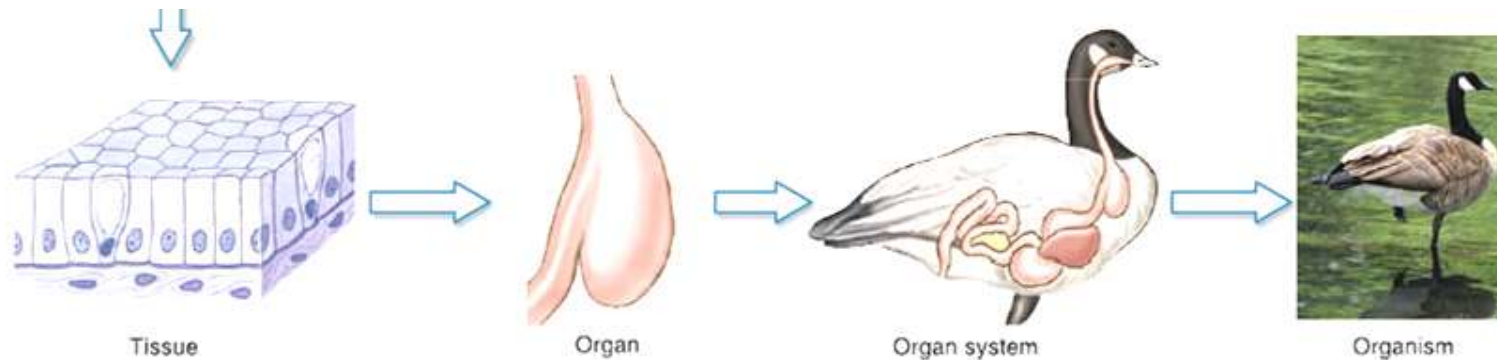


FIGURE 1. Diagrammatic representation of different nomenclatural interpretations for species A through I, mapped to a hypothesized phylogeny. Taxonomist 1 recognizes three new genus names; the genus *Aus* is typified by species A; *Cus* by species C, and *Eus* is by species E. Taxonomist 2 treats them as congeners (the diagram assumes that *Aus* has nomenclatural priority over *Cus*, and *Cus* over *Eus*). Taxonomist 3 recognizes two genera. Taxonomist 4 believes the underlying phylogeny is incorrect, and interprets the breakdown of two genera differently. Typification is necessary to establish which cluster each genus name is associated with, when taxonomic definitions of genera change.

ORGANISASI TINGKAT KEHIDUPAN



Different Hierarchical Levels of Biological Complexity That Display Reproduction, Variation, and Heredity

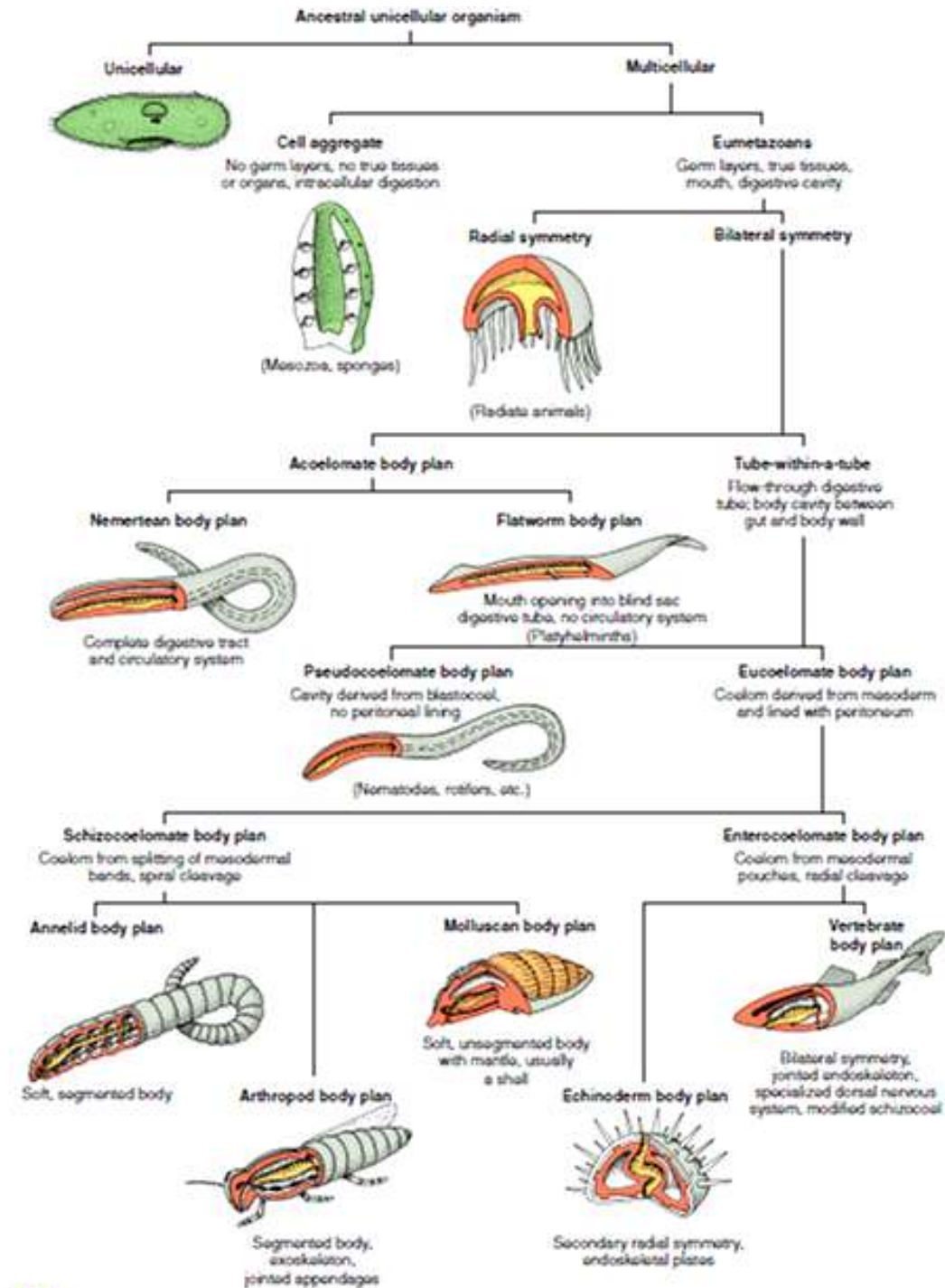
Level	Timescale of Reproduction	Fields of Study	Methods of Study	Some Emergent Properties
Cell	Hours (mammalian cell = ~16 hours)	Cell biology	Microscopy (light, electron), biochemistry	Chromosomal replication (meiosis, mitosis), synthesis of macromolecules (DNA, RNA, proteins, lipids, polysaccharides)
Organism	Hours to days (unicellular); days to years (multicellular)	Organismal anatomy, physiology, genetics	Dissection, genetic crosses, clinical studies, physiological experimentation	Structure, functions and coordination of tissues, organs and organ systems (blood pressure, body temperature, sensory perception, feeding)
Population	Up to thousands of years	Population biology, population genetics, ecology	Statistical analysis of variation, abundance, geographical distribution	Social structures, systems of mating, age distribution of organisms, levels of variation, action of natural selection
Species	Thousands to millions of years	Systematics and evolutionary biology, community ecology	Study of reproductive barriers, phylogeny, paleontology, ecological interactions	Method of reproduction, reproductive barriers

ANIMAL BODY

- Kelompok spesies hewan yg saling *share* level kekompleksan organisasi tubuhnya → **grade**
- Struktur tubuh **dibatasi oleh keturunan**, fitur utama (major features) akan **termodifikasi**, tetapi **jarang sekali hilang**
- Struktur tubuh hewan **berbeda** pada: *grade of organization, body symmetry, number of germ layers, and type of body cavity.*

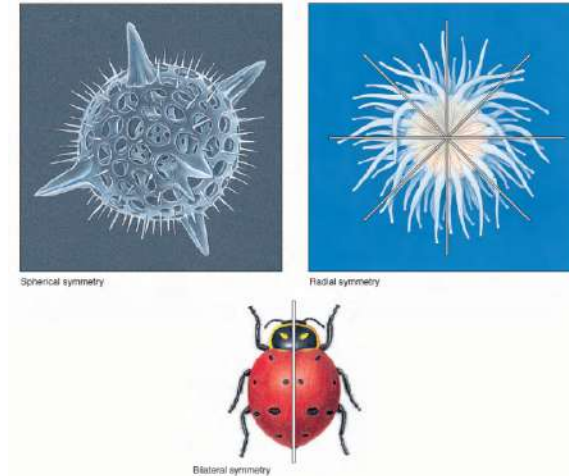


From Simple to Complex

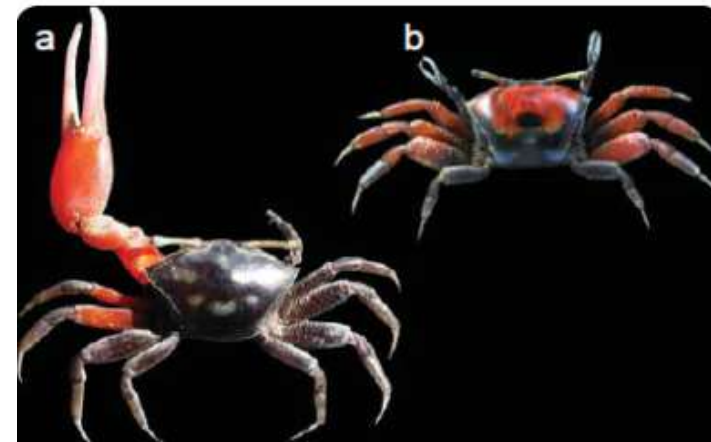
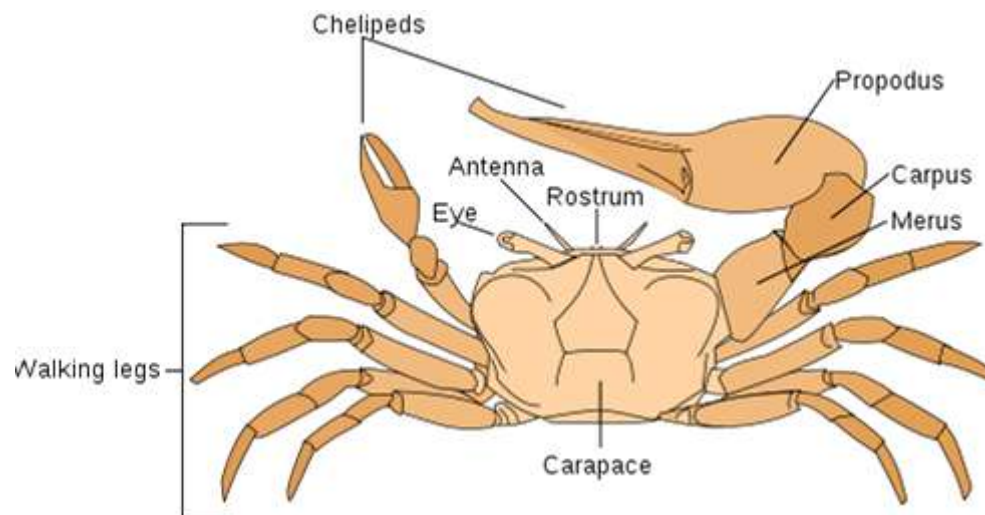


SIMETRI TUBUH

Simetri: Keadaan tubuh organisme atau alat yg apabila **dibagi** oleh **suatu bidang tertentu** maka kedua belahannya, yg satu **persis sama** dengan yg lain.



Asimetri: **tidak ada kesamaan** antara satu sisi dgn sisi lainnya pd sesuatu tubuh/ alat dari suatu organisme

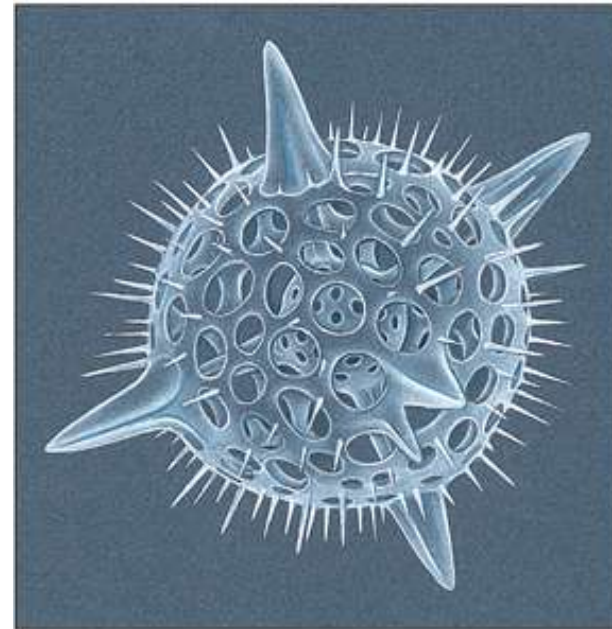


Ex: Kepiting Uca (Fiddler Crab)

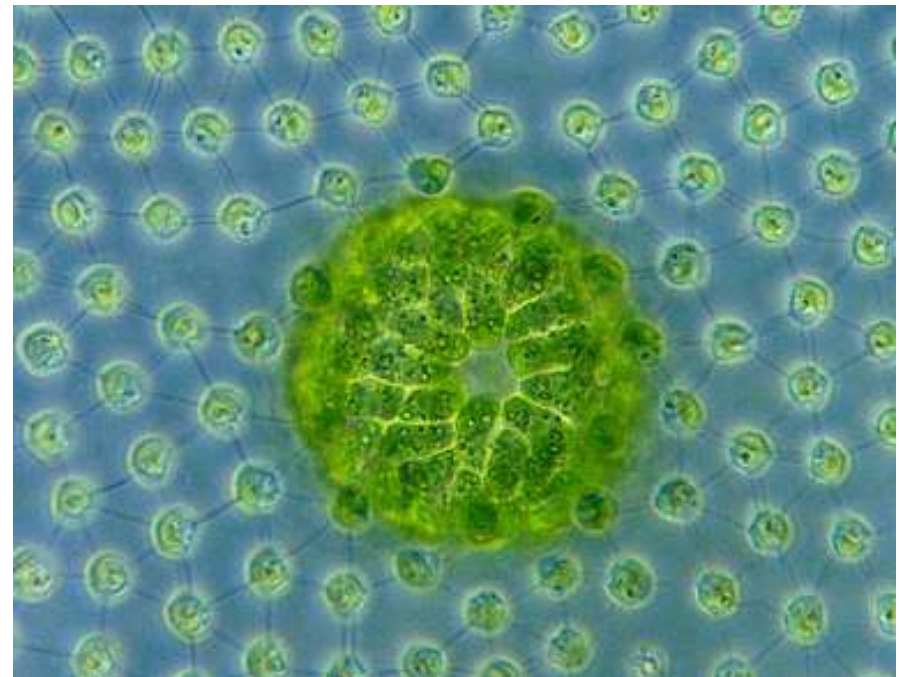
SPHERICAL SYMMETRY

- Terdapat pd hewan yg bentuk tubuhnya bulat spt bola
- Jika kita memotong di bagian tengah akan terbagi menjadi *mirror image halves*.
 - Kebanyakan ditemukan pada kelompok Protista.

Ex: Volvox (Green Algae)



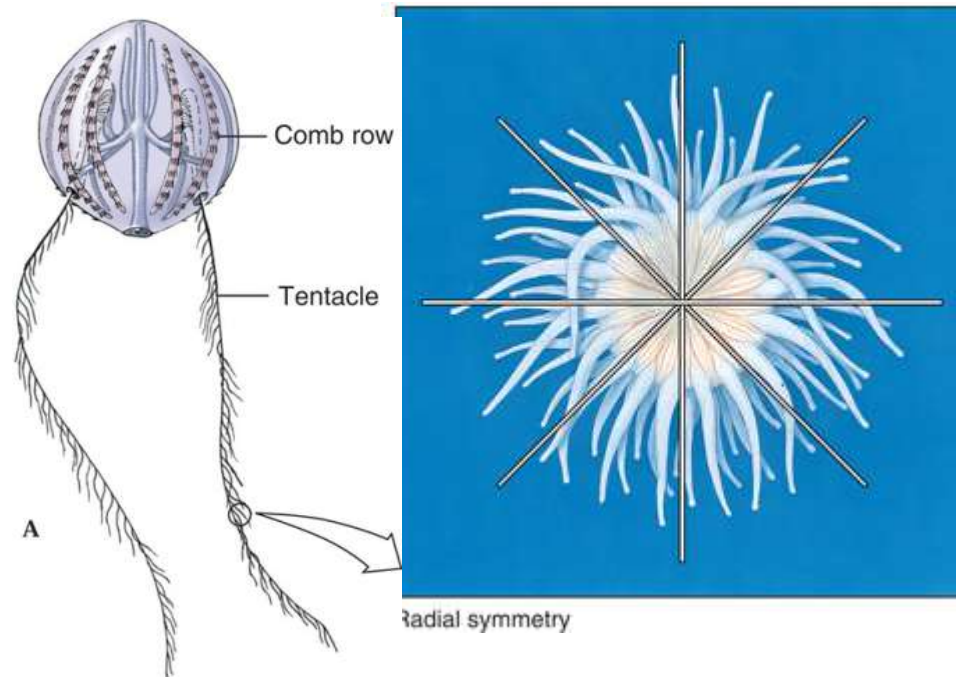
Spherical symmetry



- **RADIAL SYMMETRY**

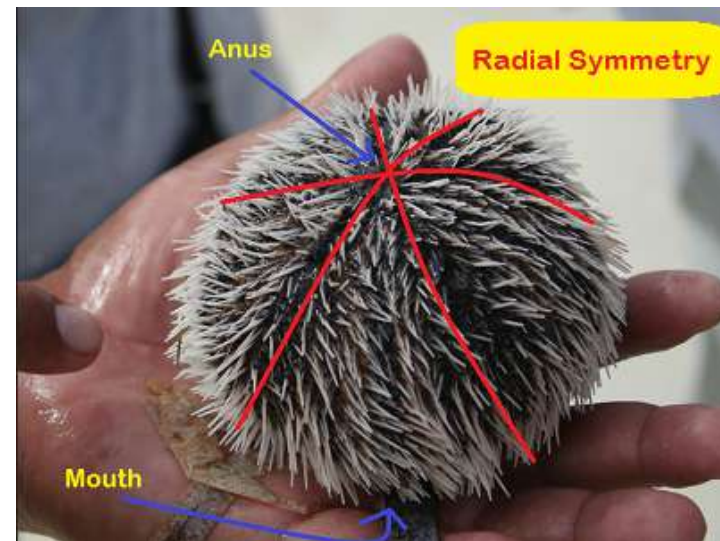
more than two planes passing through the longitudinal axis can divide the organism into mirror image halves.

- Pada hewan yg beberapa bagian tubuhnya tersusun sedemikian rupa, mengelilingi suatu axis tertentu/seperti jari-jari atau roda
 - Ubur-ubur



- **BIRADIAL SYMMETRY** – *two planes* will divide the organism.

- Kombinasi antara simetri bilateral dn simetri radial
- **Contoh: Asterias (bintang laut)**
- dilihat dari madreporitnya simetri bilateral
- dilihat dari lengan-lengan radier simetri radial
 - Comb jellies



- **BILATERAL SYMMETRY** is found in organisms where one plane can pass through the organism dividing it into **right and left halves**.
 - Better for directional movement.
 - Monophyletic group called **Bilateria**.
- Tubuh dibagi arah **craniocaudal belahan yang dihasilkan persis sama**.
- Pada hewan-hewan yg bergerak maju, dgn karakter bagian anterior adl kepala (ada alat indra, sistem saraf, mulut) pada hewan-hewan yang merayap.
- **Contoh:** manusia, tetrapoda, kupu-kupu dan lain-lain.

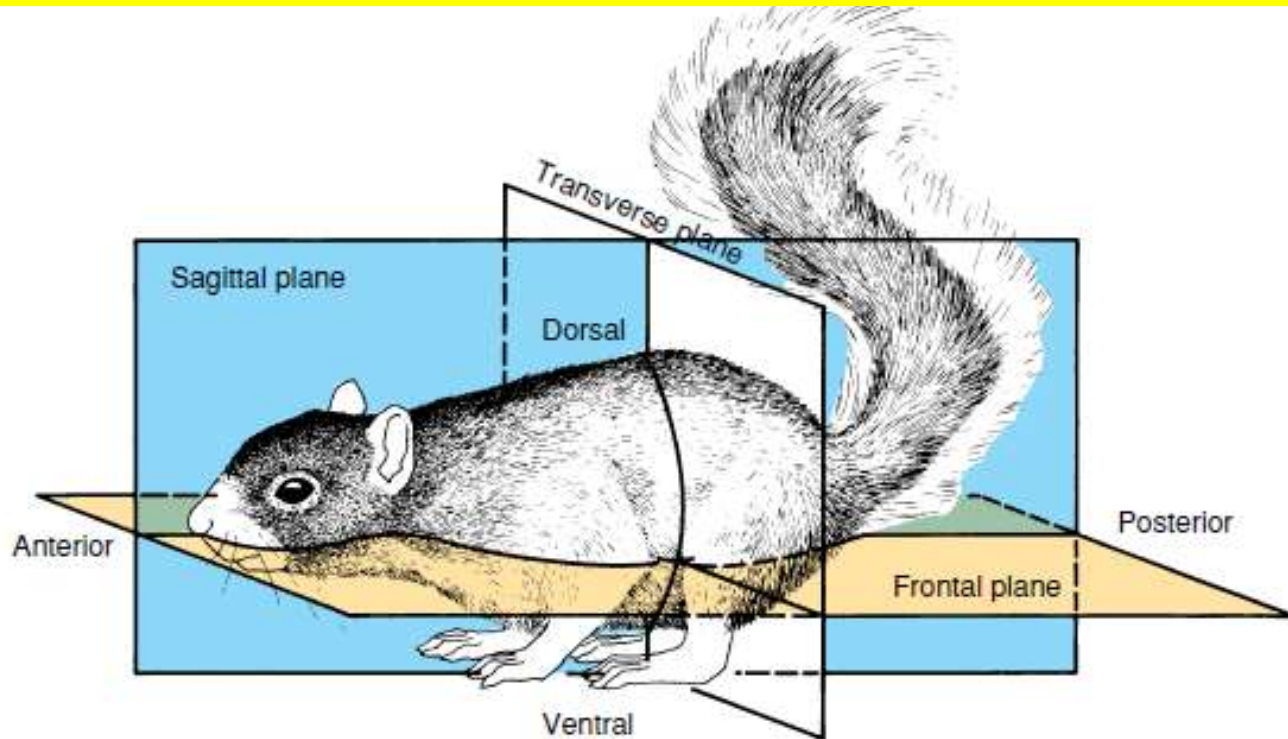


Bilateral symmetry

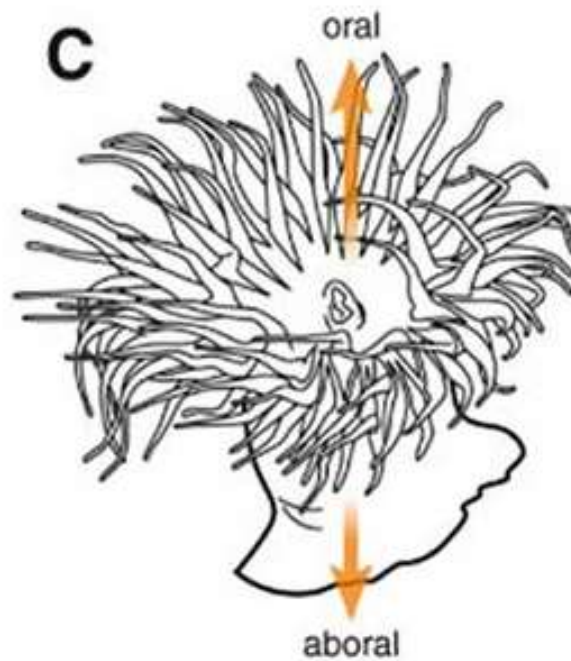
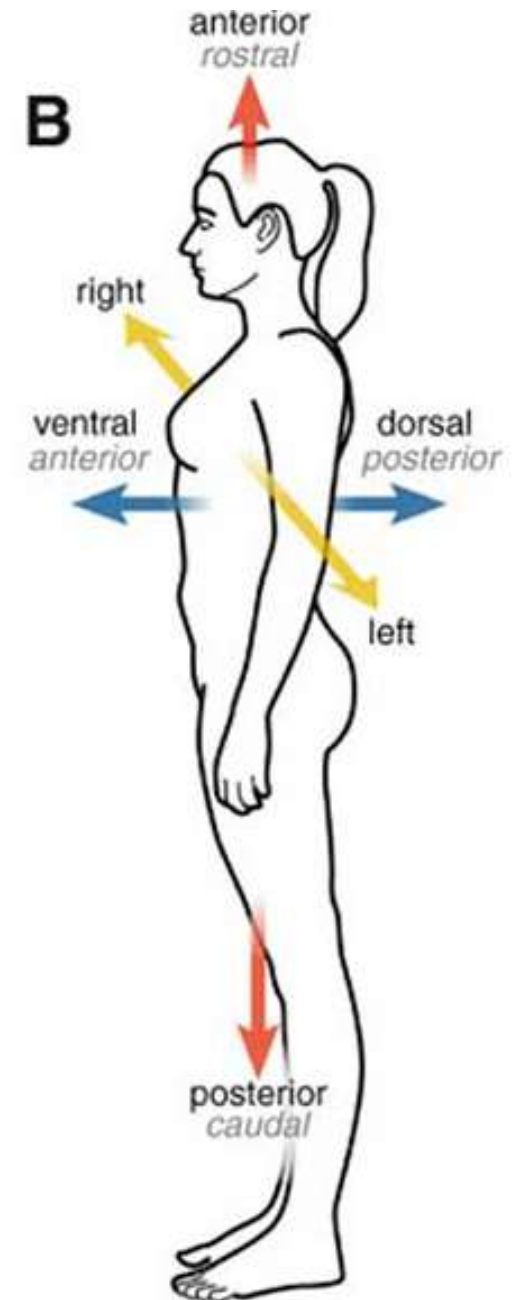
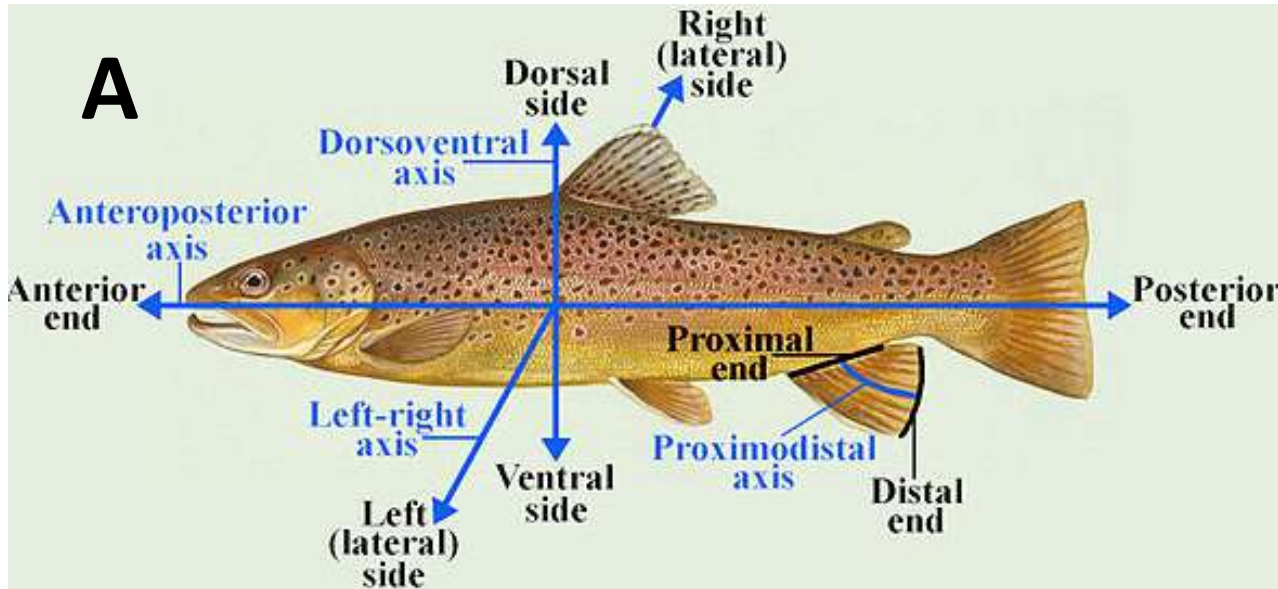
Tulis Di Buku Tugas

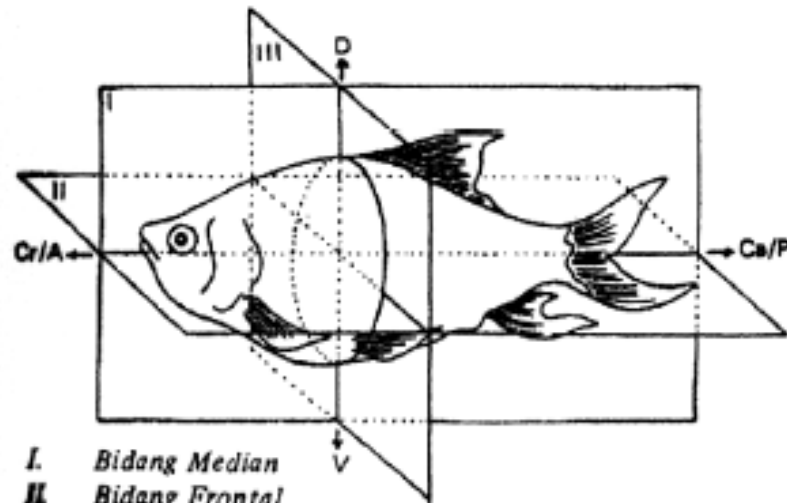
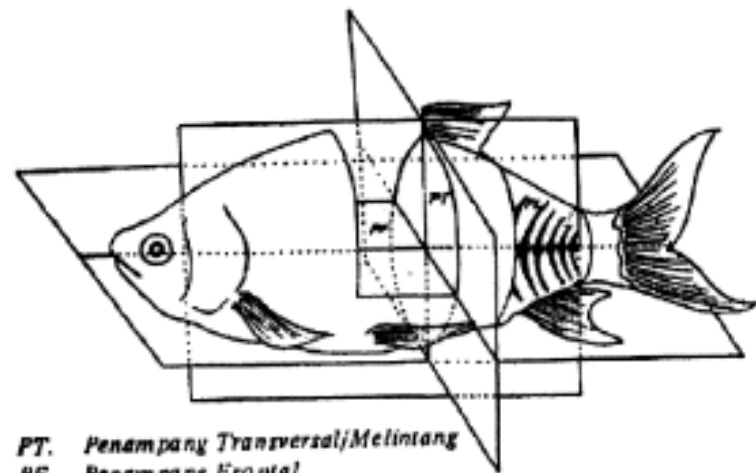
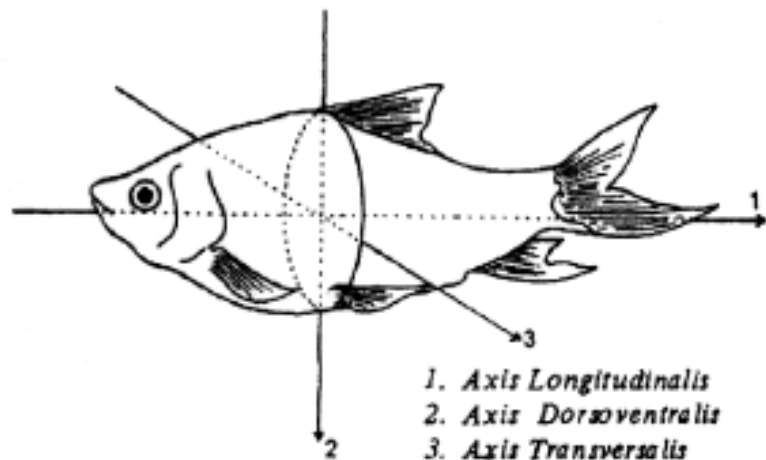
- Grade of Organization (mulai tingkat sel, jaringan-organ, jaringan-sistem, dll)
- Homaxoni
- Heteraxoni
- Monaxoni
- Protostom
- Deuterostomes
- Xenacoelomorpha
- Spesies Hibrid
- Spesies Cryptic
- Spesies Politipik
- Spesies Monotipik
- Holotipe, Allotype, Lectotype, Cotype, Syntype, Paratype
- Plesiotype, Metatype, Topotype
- Pengertian
- Contoh Hewan

Regions of a Bilaterally Symmetrical Animal

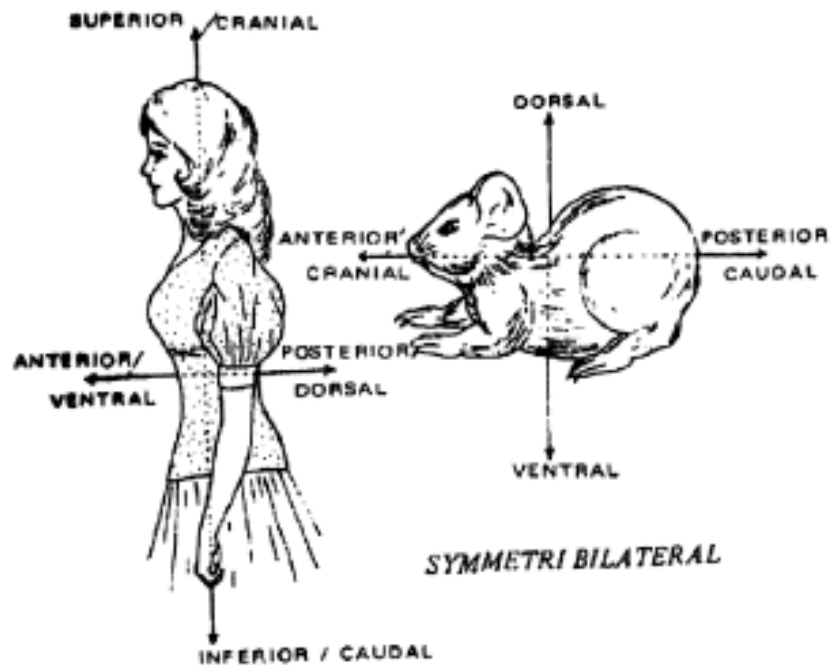


- Anterior-posterior (**Transverse Plane**)
- Dorsal-ventral (**Frontal Plane**)
- Left-right (**Sagittal Plane**)
- Proximal-Distal
- Medial-Lateral





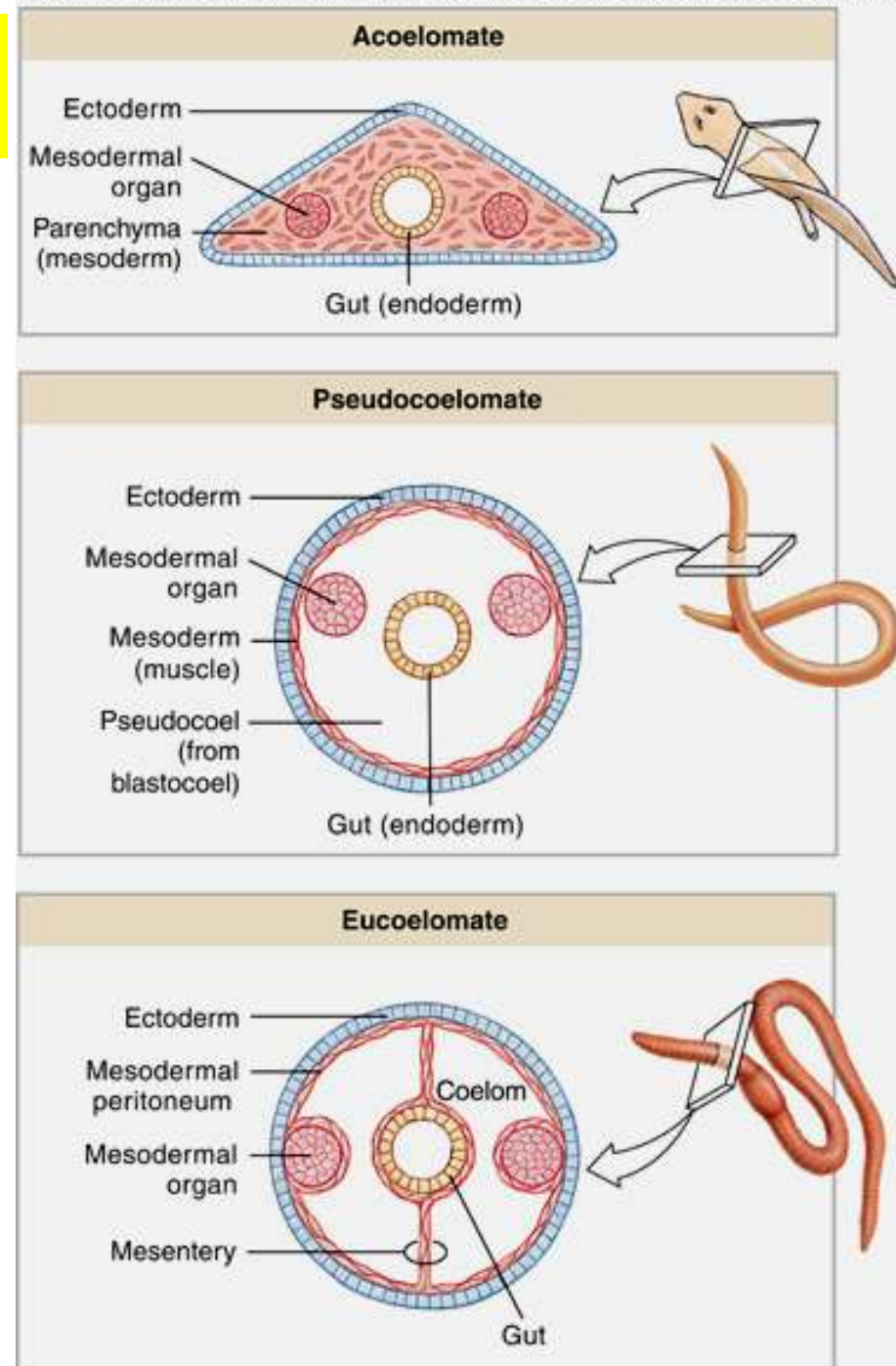
SYMMETRI BILATERAL



Rongga Tubuh (Body Cavities)

- In protostomes, Mesoderm forms as Endodermal cells from near the Blastopore (external opening) migrate into the Blastocoel.
- Three body plans possible:
 - **Acoelomate** (no body cavity)
 - **Pseudocoelomate** (body cavity between endoderm & mesoderm)
 - **Coelomate** (body cavity surrounded by mesoderm)

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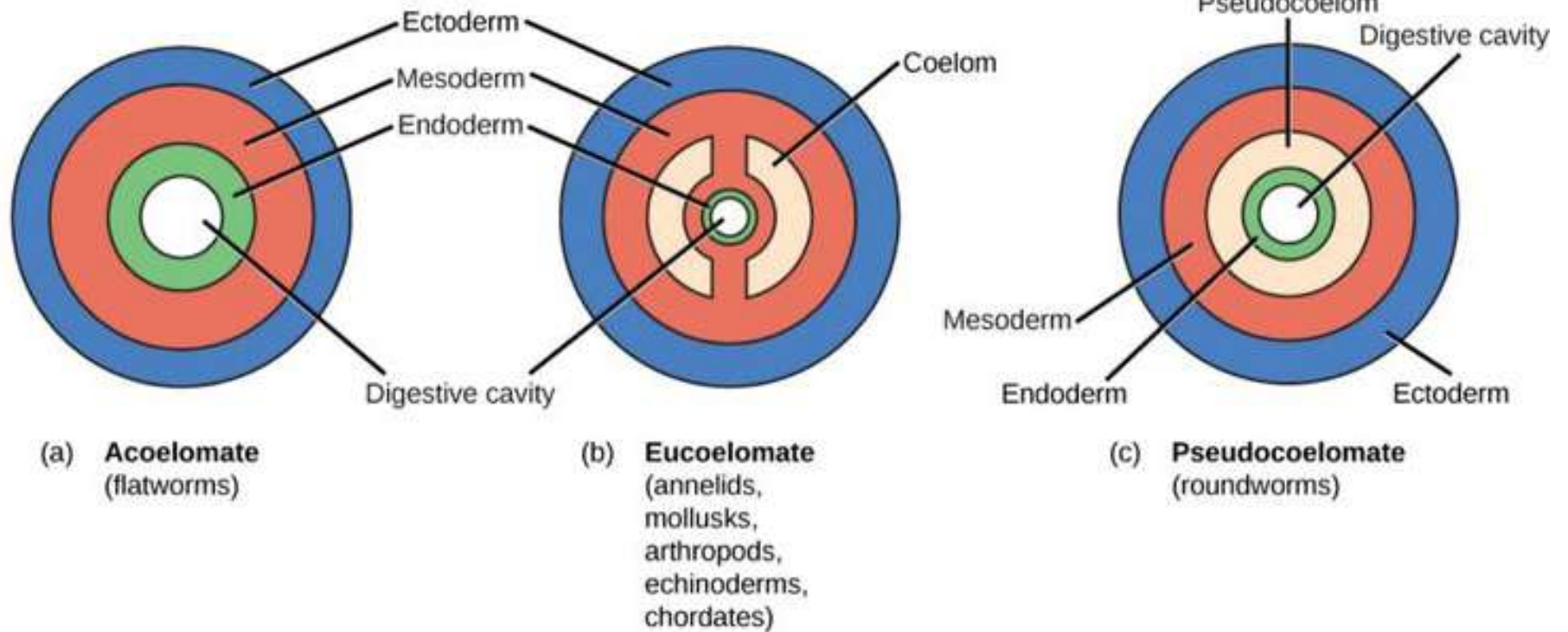
Flatworm: *Pseudobiceros bedfordi*



Annelid: *Glycera*



Nematode: *Heterodera glycines*



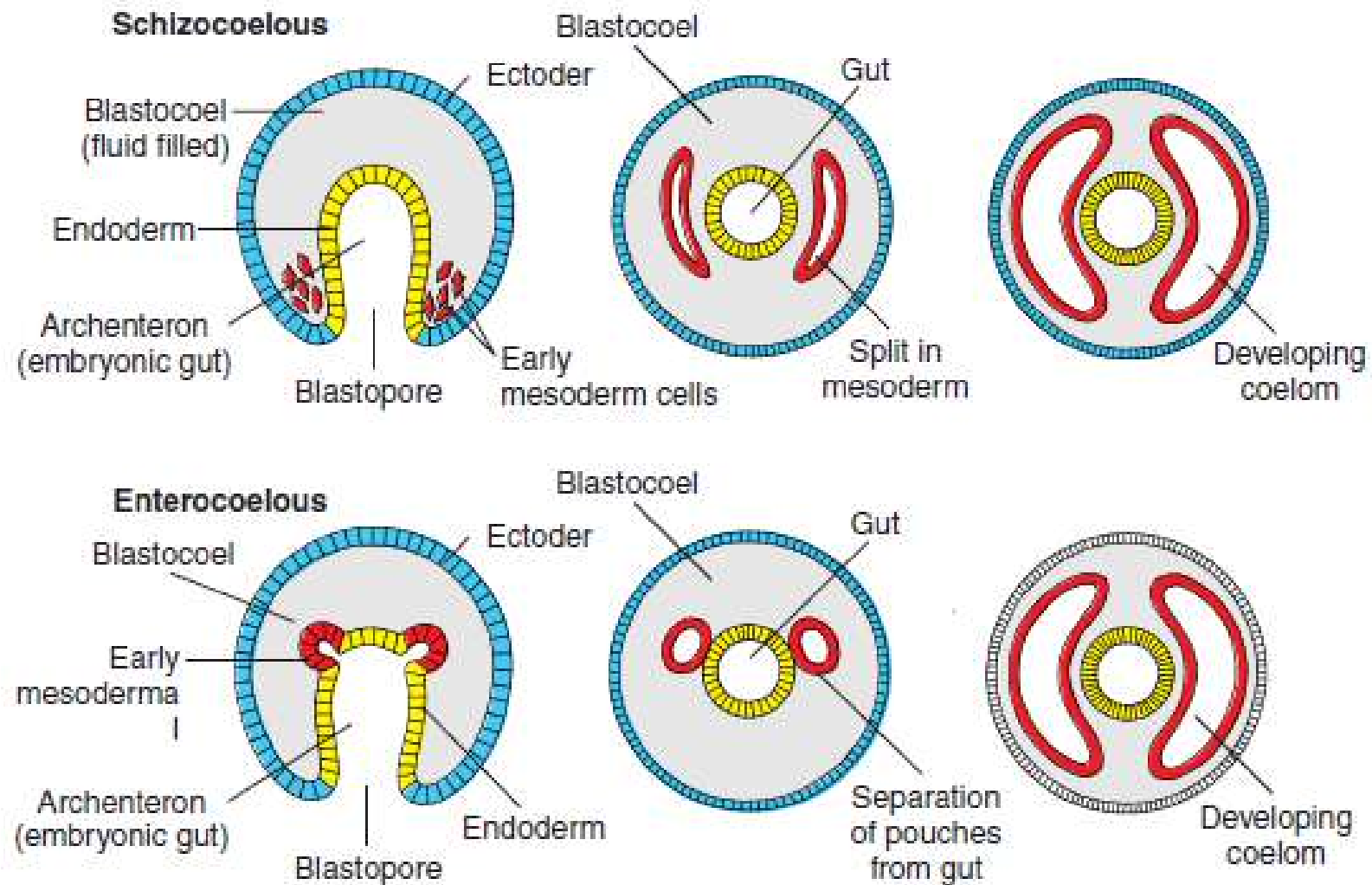
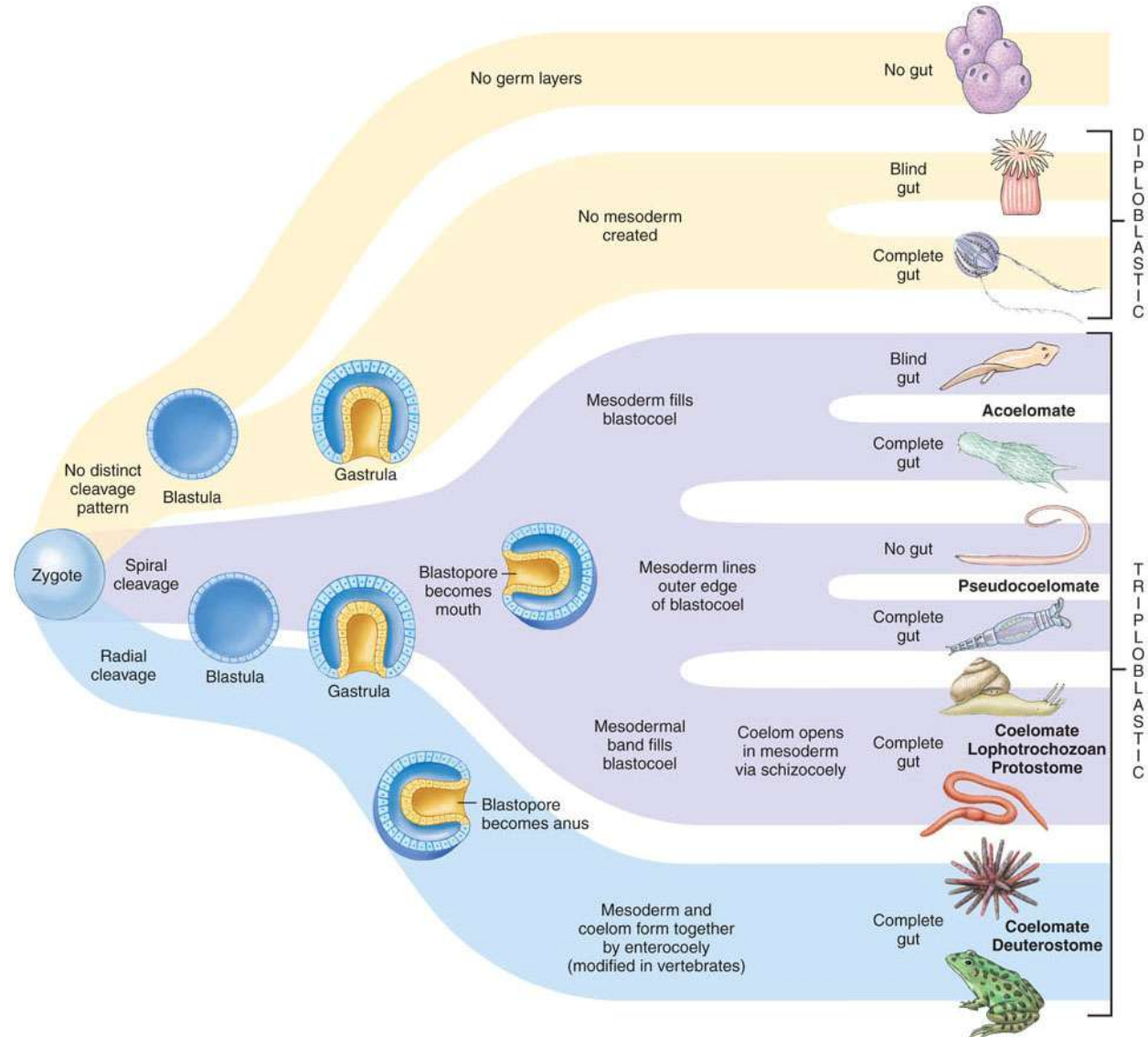


Figure 9-13

Types of mesoderm and coelom formation. In schizocoelous formation, the mesoderm originates from the wall of the archenteron near the blastopore and proliferates into a band of tissue that splits to form the coelom. In enterocoelous formation, most mesoderm originates as a series of pouches from the archenteron; these pinch off and enlarge to form the coelom. In both formations, the coeloms expand to obliterate the blastocoel.

Pola Perkembangan (Berdasarkan Germ Layer)

- Sponges berkembang hanya pada tahap blastula, dan *ter-reorganize* menjadi bentuk dewasa
- **Gastrulasi** → organisasi tingkat jaringan (tissue)
 - **Diploblastic** – 2 germ layers
 - **Triploblastic** – 3 germ layers



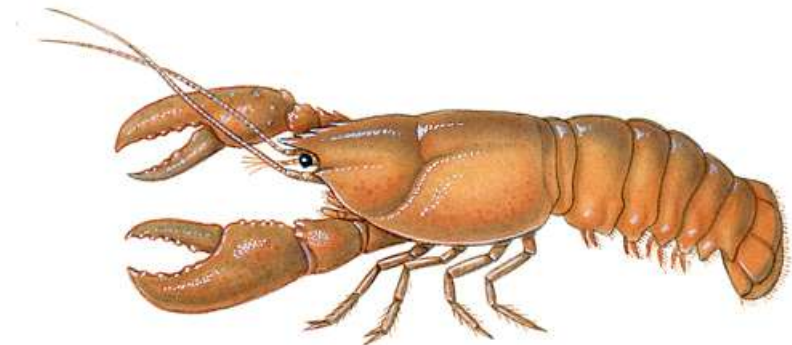
Kunci Lain untuk Identifikasi Tubuh

- Segmentasi: Keadaan tubuh yg terbagi-bagi dlm ruas-ruas dgn susunan yg sama.
- **Misal: Cacing tanah (*Lumbricus terrestris*)**
- Susunan tubuh yang beruas-ruas ini disebut juga **metameri**
- Bagian yg bertulang disebut: **metamer, segmen atau somit**
- **Metameri Homonom:** bila segmen-segmen sama bentuknya (pada cacing tanah)
- **Metameri Heteronom:** bila segmen-segmen tdk sama bentuknya (misal: pada Crustacea (udang))

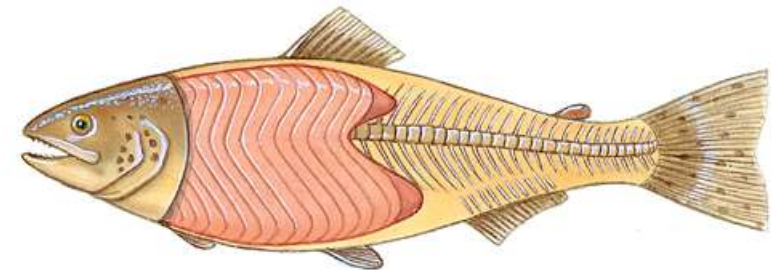
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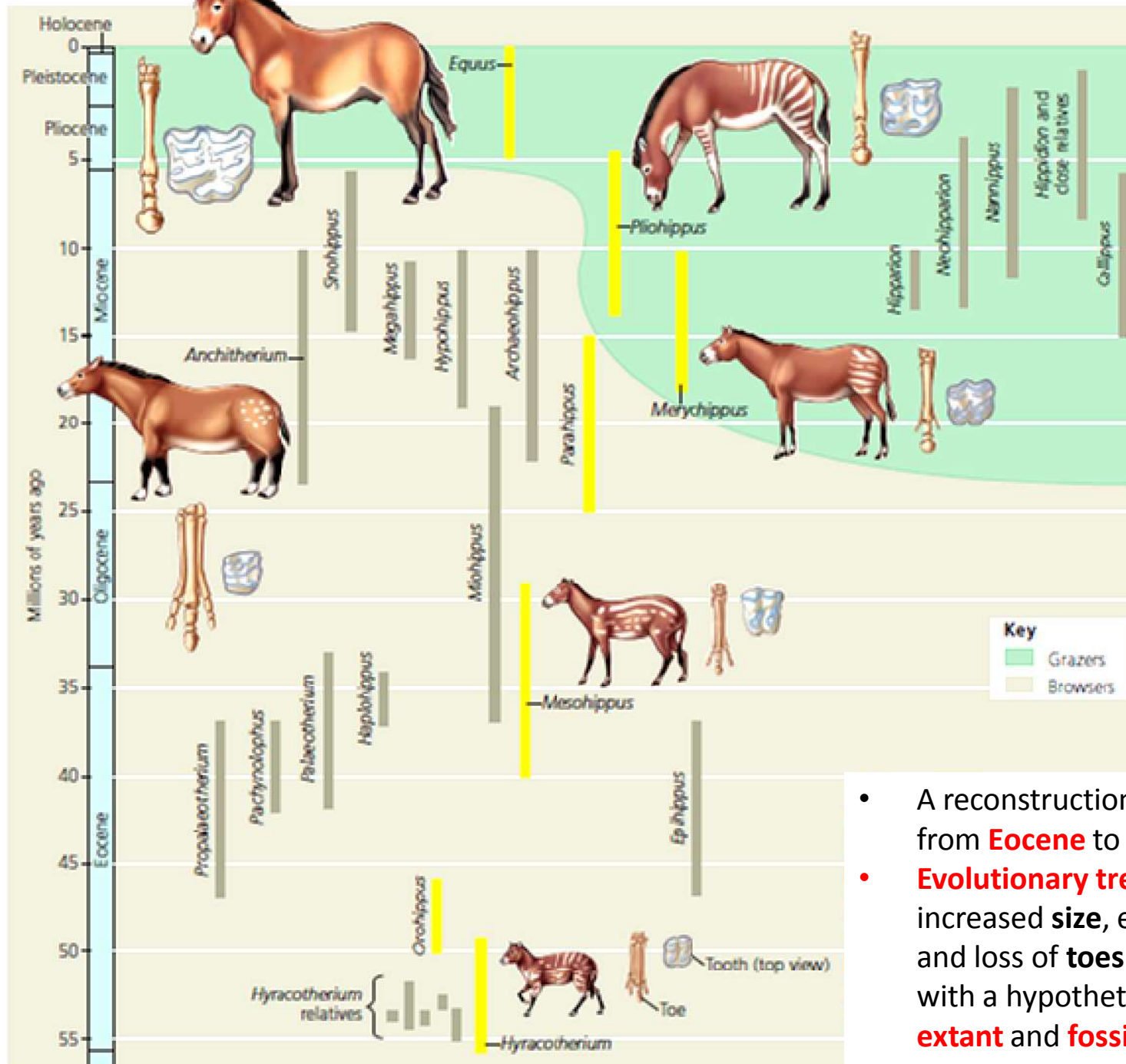
Annelida



Arthropoda



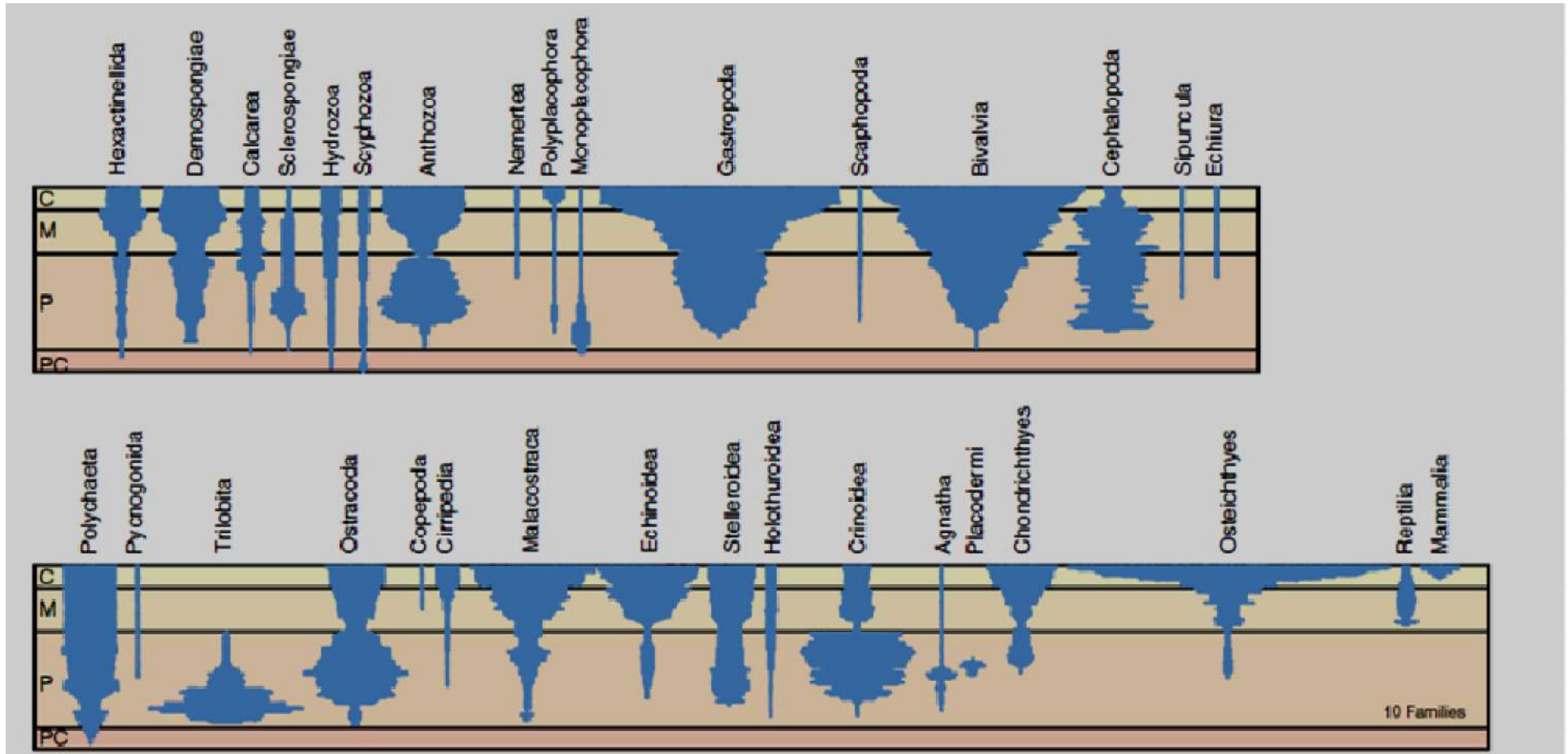
Chordata



TAXONOMY ALSO DEALING WITH EVOLUTION



















- A reconstruction of genera of horses from **Eocene** to **present**.
- **Evolutionary trends** toward increased **size**, elaboration of **molars**, and loss of **toes** are shown together with a hypothetical genealogy of **extant** and **fossil** genera.

Profil Diversitas **Family** dari Berbagai Kelompok Hewan Berdasarkan Fosil yang Ditemukan



Precambrian (PC)
Paleozoic (P)

Mesozoic (M)
Cenozoic (C)

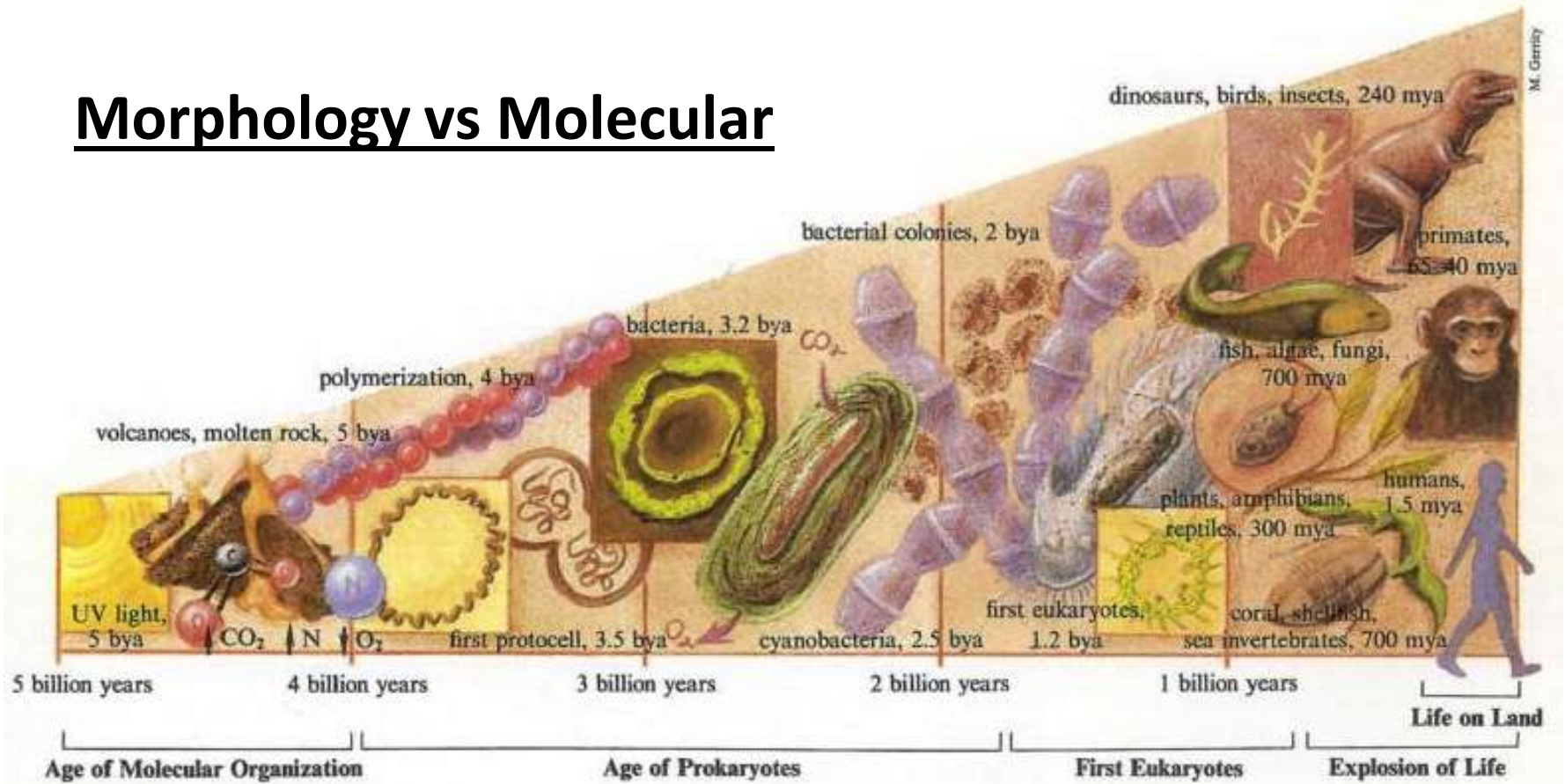
Eons (duration not to scale)	Era	Period	Epoch	Age (Millions of Years Ago)	Some Important Events in the History of Life	
Phanerozoic	Cenozoic	Quaternary	Holocene	0.01	Historical time	
			Pleistocene	2.6	Ice ages; origin of genus <i>Homo</i>	
		Neogene	Pliocene	5.3	Appearance of bipedal human ancestors	
			Miocene	23	Continued radiation of mammals and angiosperms; earliest direct human ancestors	
		Paleogene	Oligocene	34	Origins of many primate groups	
			Eocene	56	Angiosperm dominance increases; continued radiation of most present-day mammalian orders	
			Paleocene	66	Major radiation of mammals, birds, and pollinating insects	
	Mesozoic	Cretaceous	145	Flowering plants (angiosperms) appear and diversify; many groups of organisms, including most dinosaurs, become extinct at end of period		
		Jurassic	201	Gymnosperms continue as dominant plants; dinosaurs abundant and diverse		
		Triassic	252	Cone-bearing plants (gymnosperms) dominate landscape; dinosaurs evolve and radiate; origin of mammals		
	Paleozoic	Permian	299	Radiation of reptiles; origin of most present-day groups of insects; extinction of many marine and terrestrial organisms at end of period		
			Carboniferous	359	Extensive forests of vascular plants form; first seed plants appear; origin of reptiles; amphibians dominant	
		Devonian	419	Diversification of bony fishes; first tetrapods and insects appear		
			Silurian	444	Diversification of early vascular plants	
Ordovician		485	Marine algae abundant; colonization of land by diverse fungi, plants, and animals			
Cambrian		541	Sudden increase in diversity of many animal phyla (Cambrian explosion)			
		Ediacaran	635	Diverse algae and soft-bodied invertebrate animals appear		
Proterozoic	Neo-proterozoic	1,800	Oldest fossils of eukaryotic cells appear			
		2,500	Concentration of atmospheric oxygen begins to increase			
Archaean		2,700	Concentration of atmospheric oxygen begins to increase			
		3,500	Oldest fossils of cells (prokaryotes) appear			
Hadean		4,000	Oldest known rocks on Earth's surface			
		Approx. 4,600	Origin of Earth			

Do you believe in Evolution?

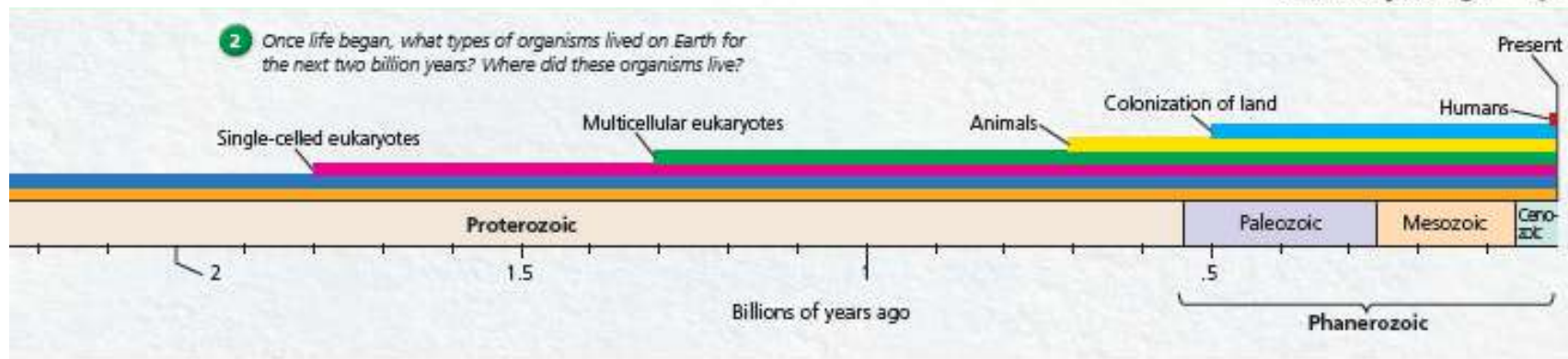
Apa itu Evolusi?

Apakah anda percaya hewan2 berasal dari air?

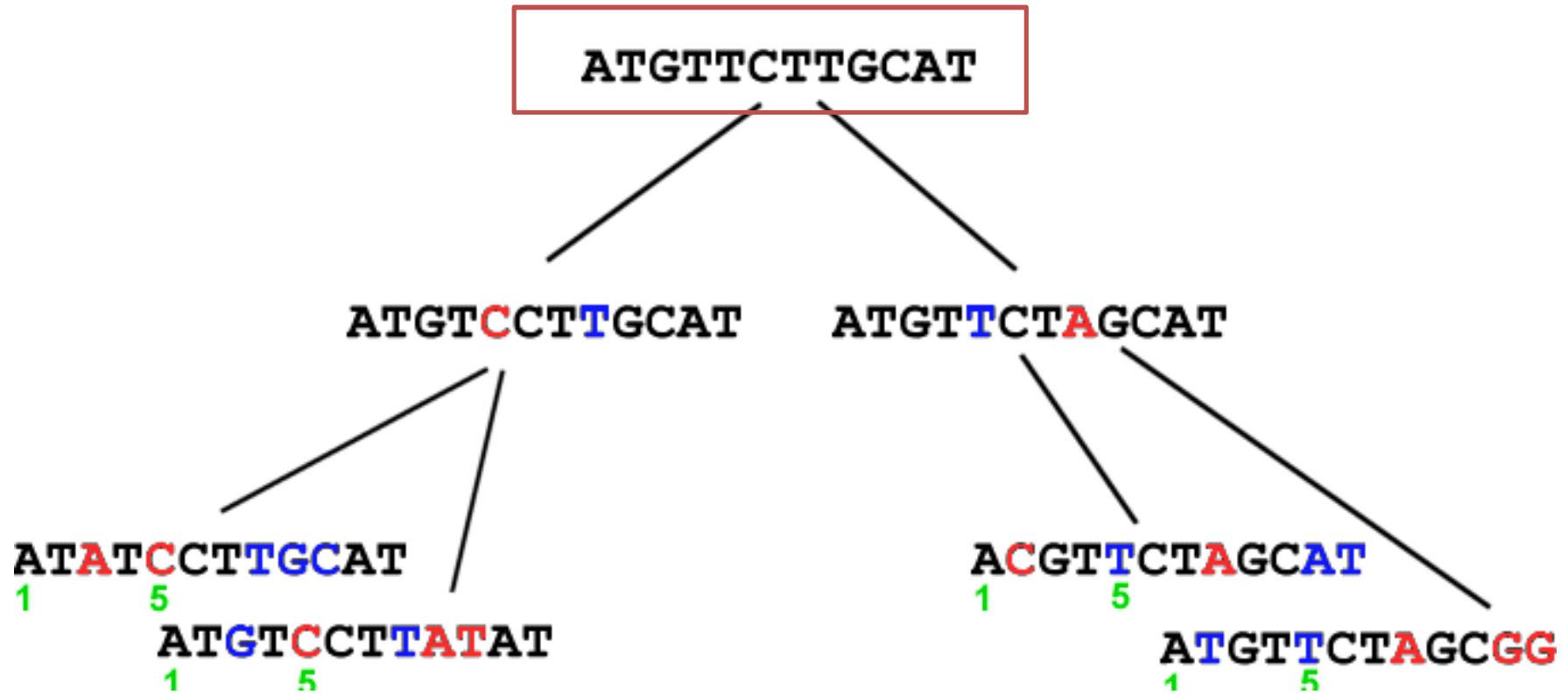
Morphology vs Molecular



Key
 millions of years ago = mya
 billions of years ago = bya

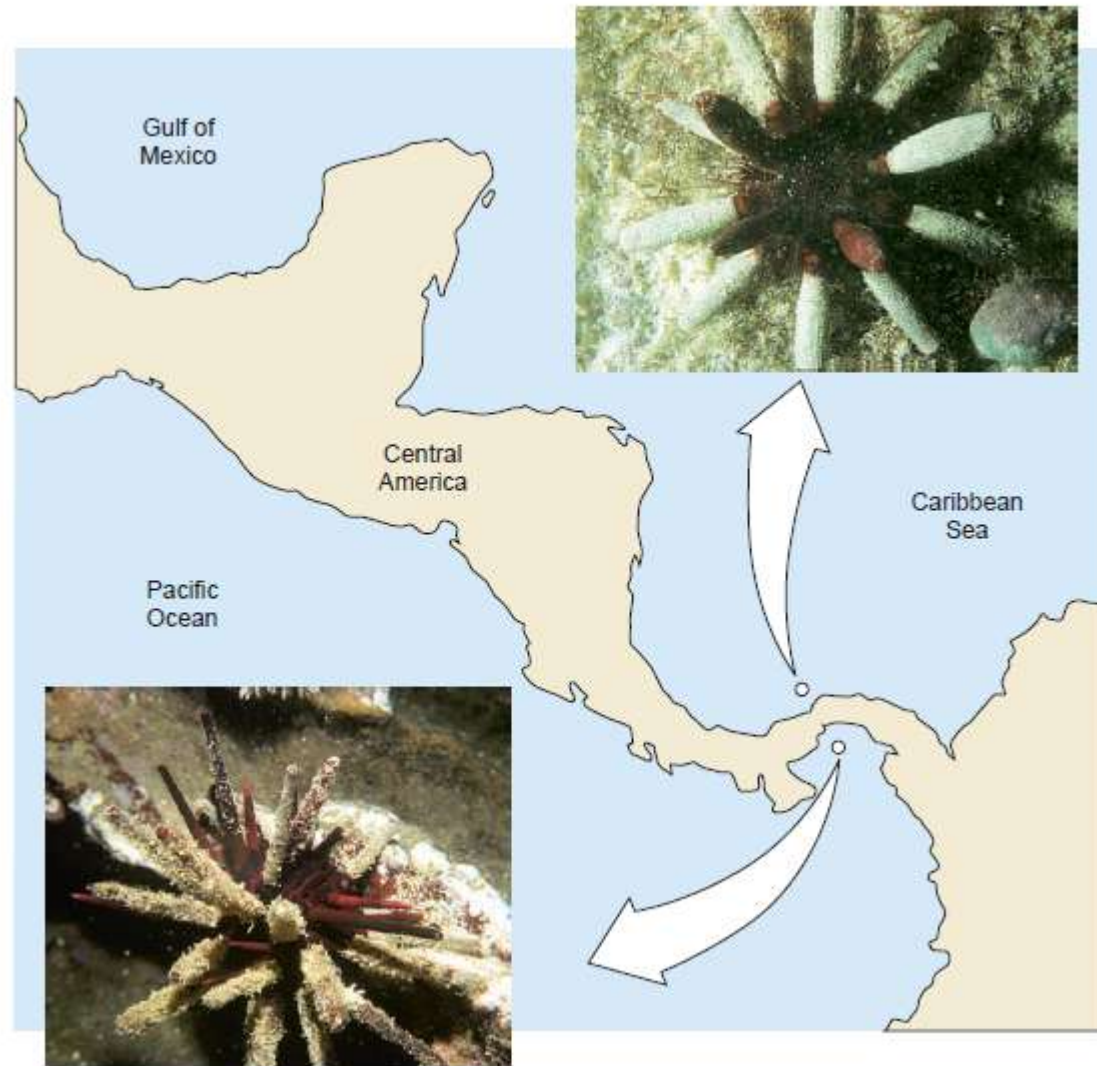


MOLECULAR EVOLUTION



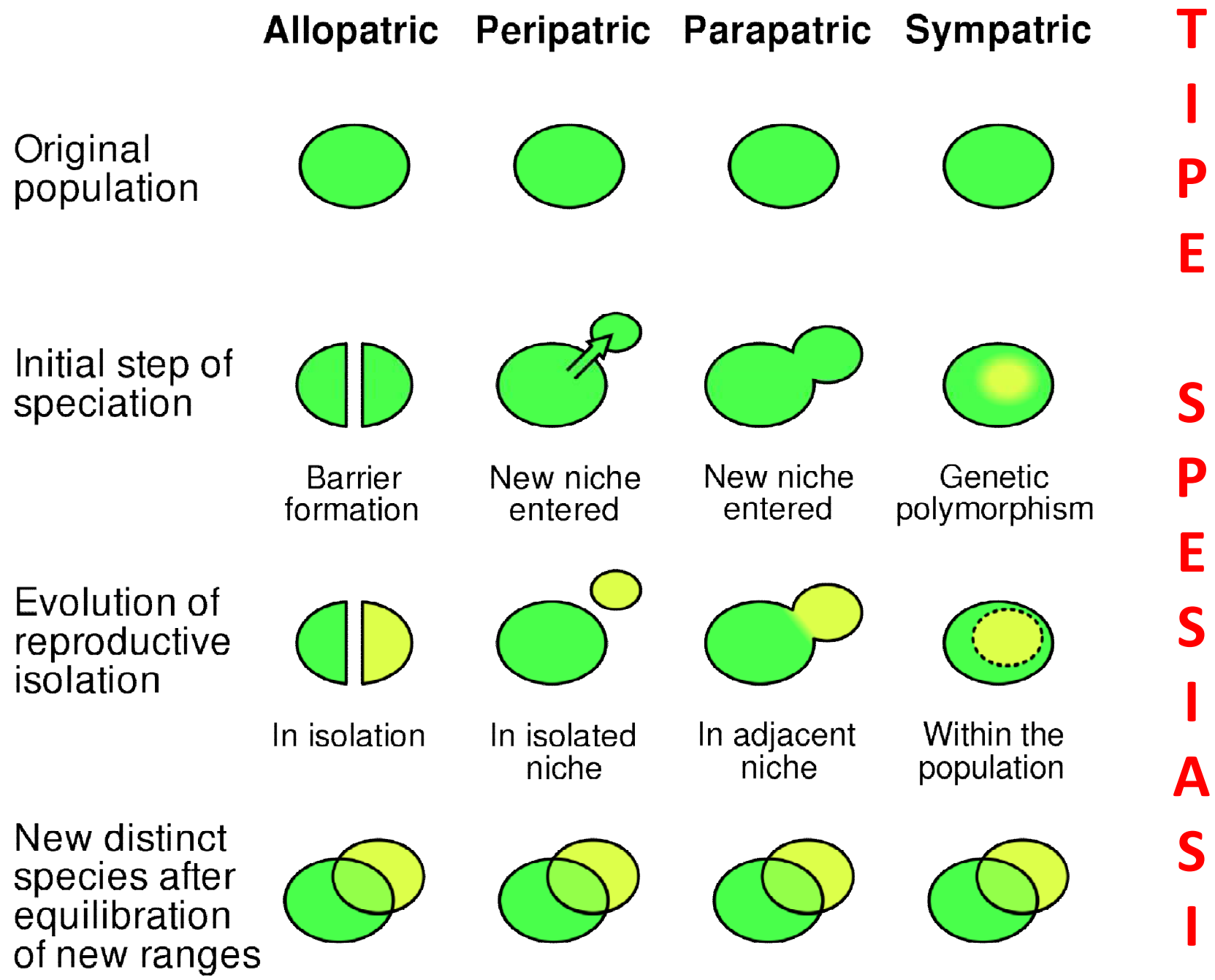
Can You Explain ??

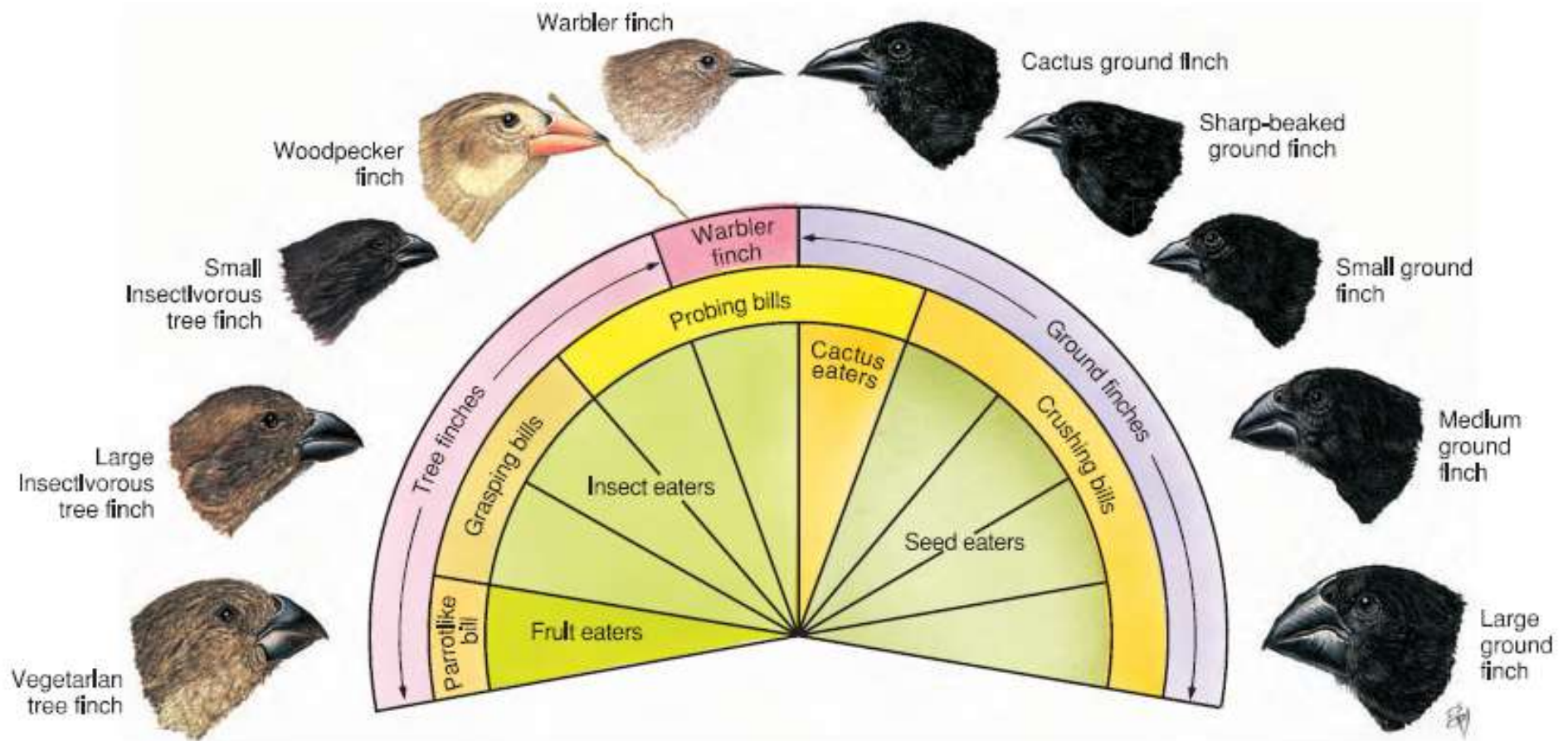
**And also how
does species
are formed?**



D

Species level—formation of new species in the sea urchin (*Eucidaris*) after geographic separation of Caribbean (*E. tribuloides*) and Pacific (*E. thouarsi*) populations by the formation of a land bridge.





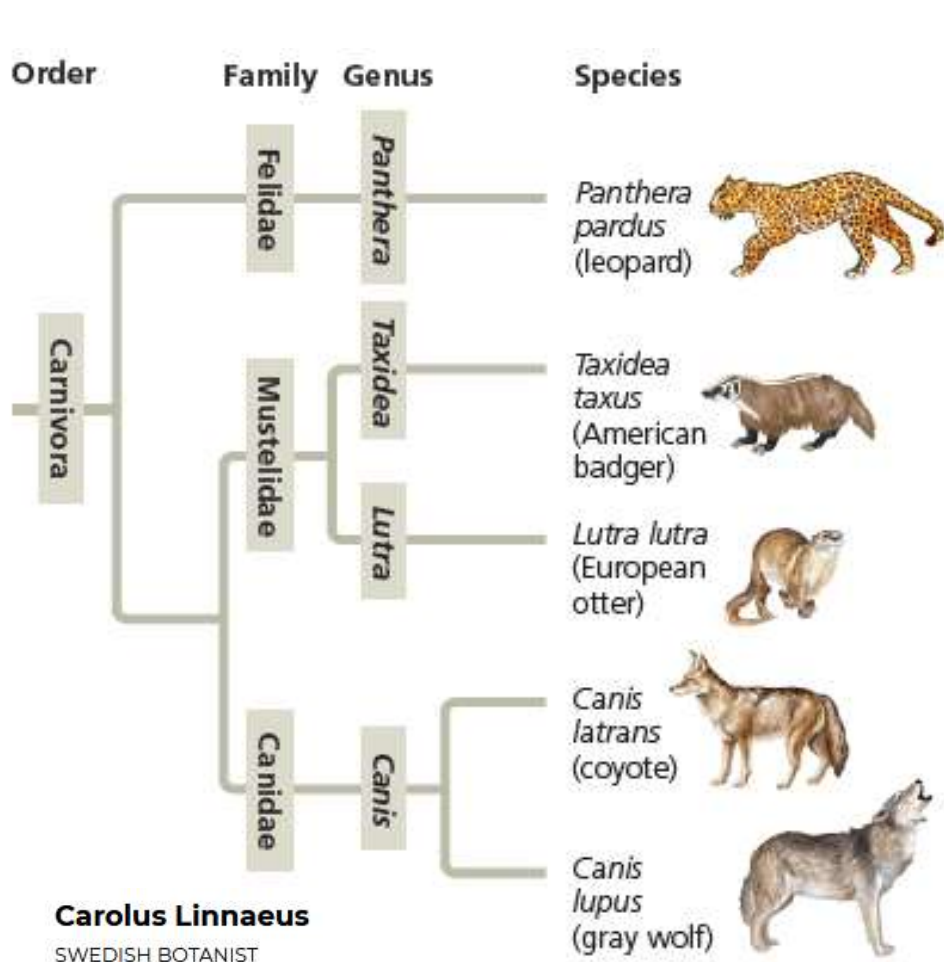
TERMASUK JENIS SPESIASI YANG MANA??

Surah An Nur (24) : 45

بَاءٌ مِّنَ اللَّامِ طُفُلًا مِّنْهُمْ لَمَنَّا يَمْشِي عَلَىٰ بَطْنِهِ وَمِنْهُمْ مَّنْ يَمْشِي عَلَىٰ رِجْلَيْنِ
يَمْشِي عَلَىٰ أَوْرَمٍ يَخْلُقُ اللَّهُ مَا يَشَاءُ إِنَّ اللَّهَ عَلَىٰ كُلِّ شَيْءٍ قَدِيرٌ

“Dan Allah menciptakan **semua jenis hewan dari air**, maka sebagian ada yang **berjalan di atas perutnya** dan sebagian berjalan dengan **dua kaki** sedang sebagian (yang lain) berjalan dengan **empat kaki**. Allah menciptakan apa yang Dia kehendaki. Sungguh, Allah Maha Kuasa atas segala sesuatu”

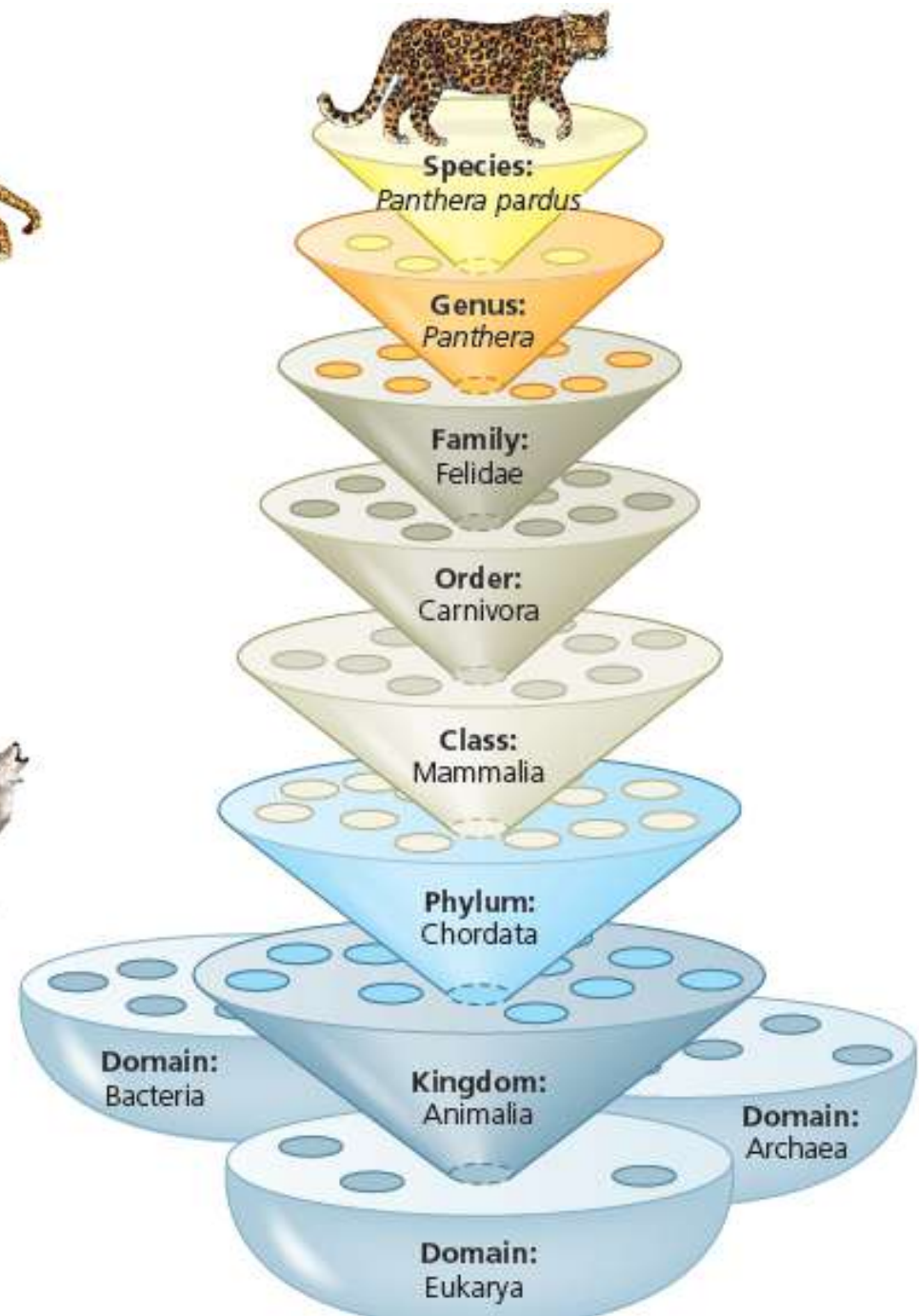




Carolus Linnaeus
SWEDISH BOTANIST



Binomial Nomenclatur



BINOMIAL NOMENCLATURE in Taxonomic Categories

Examples of Taxonomic Categories to Which Representative Animals Belong				
	Human	Gorilla	Southern Leopard Frog	Katydid
Kingdom	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata	Arthropoda
Subphylum	Vertebrata	Vertebrata	Vertebrata	Uniramia
Class	Mammalia	Mammalia	Amphibia	Insecta
Subclass	Eutheria	Eutheria	—	Pterygota
Order	Primates	Primates	Anura	Orthoptera
Suborder	Anthropoidea	Anthropoidea	—	Ensifera
Family	Hominidae	Hominidae	Ranidae	Tettigoniidae
Subfamily	—	—	Raninae	Phaneropterinae
Genus	<i>Homo</i>	<i>Gorilla</i>	<i>Rana</i>	<i>Scudderia</i>
Species	<i>Homo sapiens</i>	<i>Gorilla gorilla</i>	<i>Rana sphenoccephala</i>	<i>Scudderia furcata</i>
Subspecies	—	—	—	<i>Scudderia furcata furcata</i>

Is that fixed or not? Is it possible to revision?

KUNCI IDENTIFIKASI

- i. Kunci identifikasi tingkat famili untuk Ordo Chiroptera (* Diketahui tercatat di Sumatera tetapi tidak ditemukan di Bukit Barisan Selatan Landscape (BBSL))
- 1.1. Wajah menyerupai anjing; pada jari kedua terdapat cakar (kecuali genus *Eonycteris*); bentuk telinga sederhana tanpa tragus atau antitragus, tepi telinga menyerupai cincin Pteropodidae (ii)
 - 1.2. Wajah tidak menyerupai anjing; pada jari kedua tidak terdapat cakar; bentuk telinga kompleks dengan tragus di bagian dalam atau antitragus di bagian luar 2
 - 2.1. Wajah tampak kompleks, dengan struktur atau lipatan seperti daun pada wajah 3
 - 2.2. Wajah sederhana, tidak kompleks 6
 - 3.1. Telinga dengan antitragus 4
 - 3.2. Telinga dengan 5
 - 4.1. Daun hidung bagian tengah terdapat tonjolan (sella) diantara lubang hidung (nostrils); daun hidung belakang (lancet) lebih kurang berbentuk segitiga (triangular); sisi tepi atas dari antitragus membulat atau datar Rhinolophidae (iii)
 - 4.2. Daun hidung bagian tengah tanpa sella; daun hidung belakang umumnya datar; sisi tepi atas dari antitragus meruncing ke sisi belakang (membulat untuk genus *Coelops**) Hipposideridae (iv)
 - 5.1. Tragus panjang dan bercabang; tanpa banyak lipatan di wajah; ekor tidak tampak dari luar, jika ada terbenam di antara membran antar paha; telinga kanan dan kiri bersambungan di sisi atas kepala Megadermatidae (v)
 - 5.2. Tragus pendek dan tidak bercabang; terdapat lipatan memanjang ke bawah di bagian tengah wajah, antara mata sampai rongga hidung (nostrils); ekor panjang, bagian ujung tulang ekor menyerupai bentuk huruf "V" atau "T"; membran antar paha lebar; telinga kanan dan kiri tidak Nycteridae (vi)
 - 6.1. Ekor seluruhnya atau hampir semuanya terbenam dalam membran antar paha 7
 - 6.2. Bagian ujung ekor muncul keluar dari membran antar 8
 - 7.1. Panjang tulang jari pertama pada jari sayap ketiga < 40% tulang jari kedua.; ujung telinga lebih rendah dibanding ujung rambut kepala atau Miniopteridae (vii)
 - 7.2. Panjang tulang jari ketiga pada jari sayap ketiga sama dengan tulang jari kedua; ujung telinga melewati atau dekat dengan ujung rambut di kepala Vespertilionidae (viii)
 - 8.1. Ekor menonjol dari tengah membran antar paha; jari sayap kedua tanpa tulang jari Emballonuridae (ix)
 - 8.2. Ekor bebas mencuat/muncul di ujung selaput antar paha; jari sayap kedua dengan tulang jari 9

LIST OF TYPE TERMINOLOGY

- **Tipe Primer (*Primary Type*)**

Sebuah spesimen yang dijadikan deskripsi dasar bagi spesies baru. Primer Type ini mencakup **Holotype, Allotype, Lectotype, Cotype, Syntype, Paratype**. Mungkin lebih baik menggunakan istilah ini untuk satu spesimen dari setiap jenis kelamin yang berperan sebagai tipe. Sehingga Neotype menjadi primer dan Paratype menjadi sekunder.

- **Tipe Sekunder (*Secondary Type*)**

Sebuah spesimen yang dianggap layak untuk nama jenis (type) tetapi tidak termasuk dalam seri asli di mana deskripsi spesies baru didasarkan. Sekunder Type ini mencakup **Plesiotype, Metatype, Topotype**, dll

HOLOTYPE

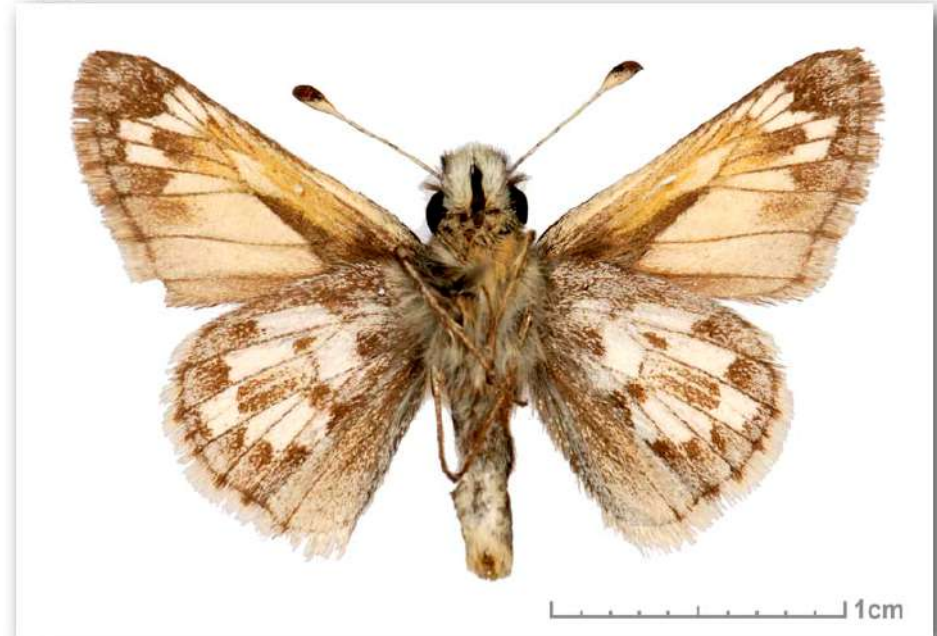
H5874



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Specimen courtesy of the California Academy of Sciences

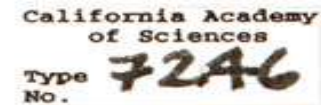
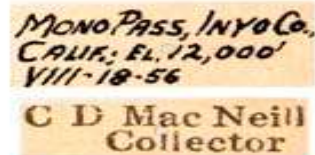
H5873



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H5825



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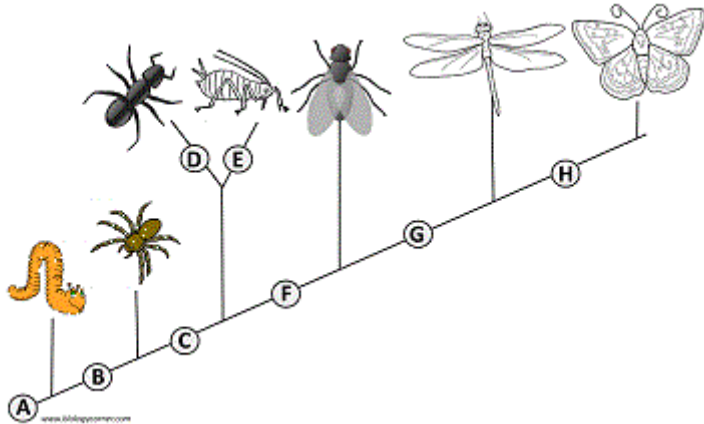
Specimen courtesy of the California Academy of Sciences

Hesperia m. miramae HOLOTYPE

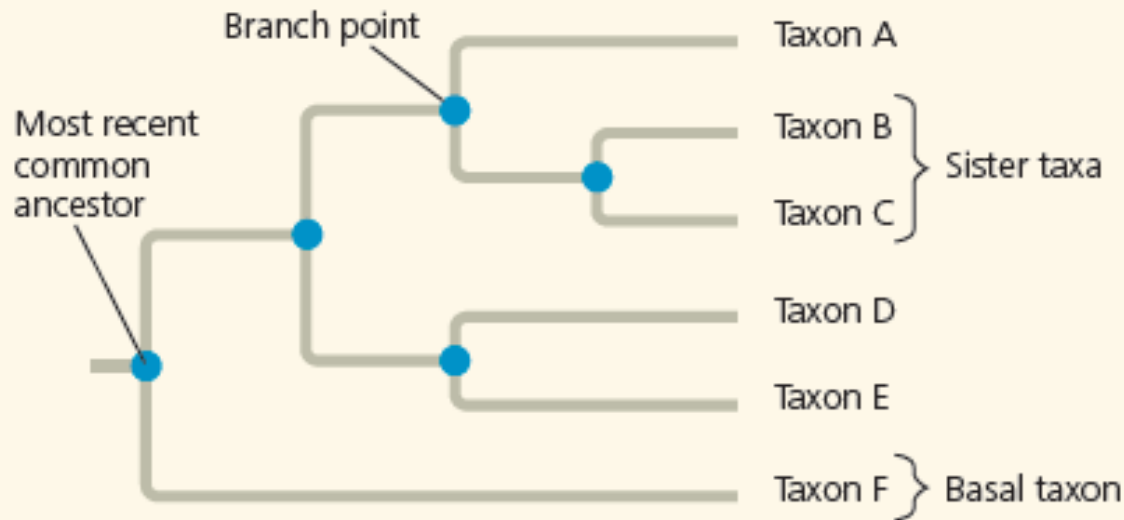
USA: CALIFORNIA: Inyo Co., Mono Pass, 12,000' 18-VIII-1956 [CAS]

photographed December 2010

KLADOGRAM VS FILOGENI



- Apa itu **KLADOGRAM**? Adl diagram yg menggambarkan hubungan evolusi (*evolutionary relationships*)
- **KLADOGRAM** berdasarkan **FILOGENI (PHYLOGENY)**
- **FILOGENI** adl studi hubungan evolusi (*evolutionary relationships*).
- Kadang **KLADOGRAM** disebut **POHON FILOGENETIK** (secara teknik, perbedaan kecil antar keduanya).
- **KLADISTIK (CLADISTICS)** adl bentuk analisisnya
- Karakter yg muncul pd organisme (tetapi tdk muncul pada organisme lama) disebut **DERIVED CHARACTERS**.

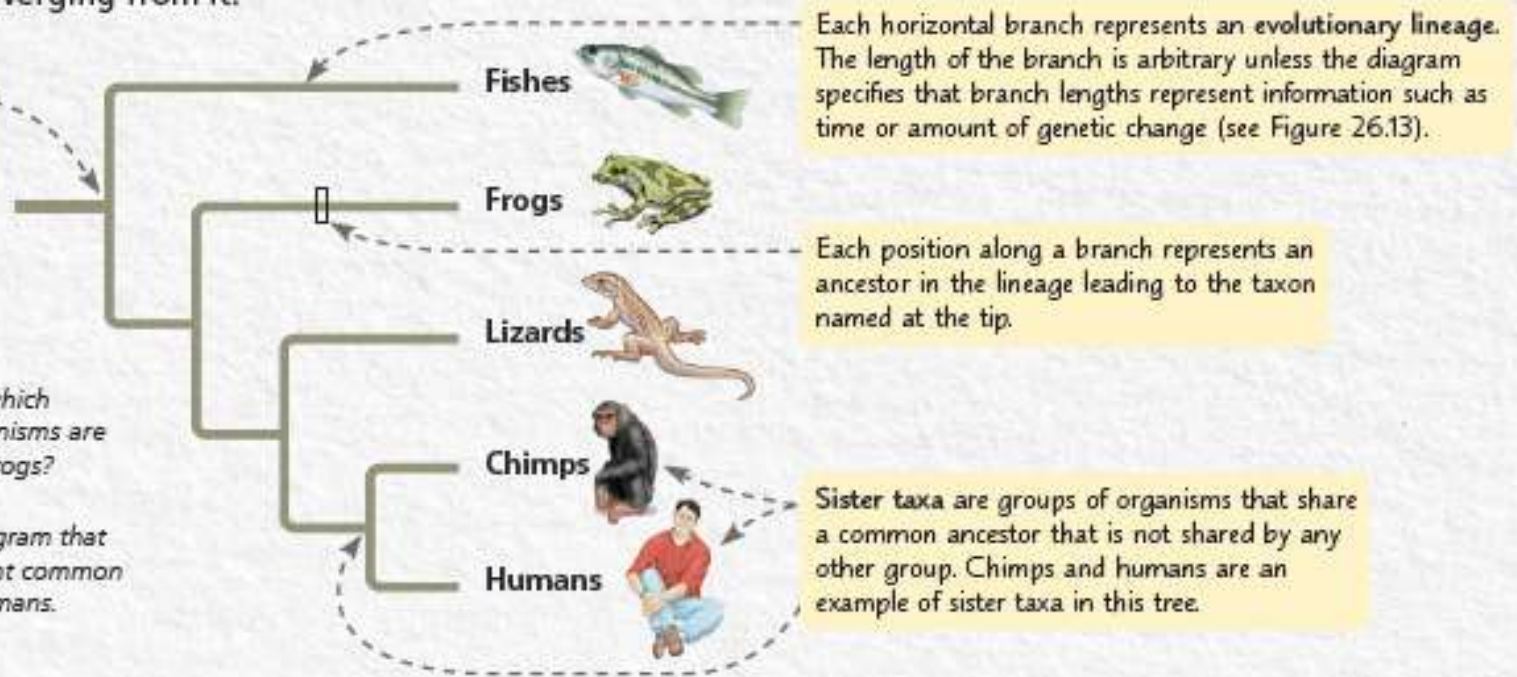


**Jadi Pohon
Filogenik
adalah.....???**

Parts of a Tree

This tree shows how the five groups of organisms at the tips of the branches, called taxa, are related. Each **branch point** represents the common ancestor of the evolutionary lineages diverging from it.

This branch point represents the common ancestor of all the animal groups shown in this tree.



Each horizontal branch represents an evolutionary lineage. The length of the branch is arbitrary unless the diagram specifies that branch lengths represent information such as time or amount of genetic change (see Figure 26.13).

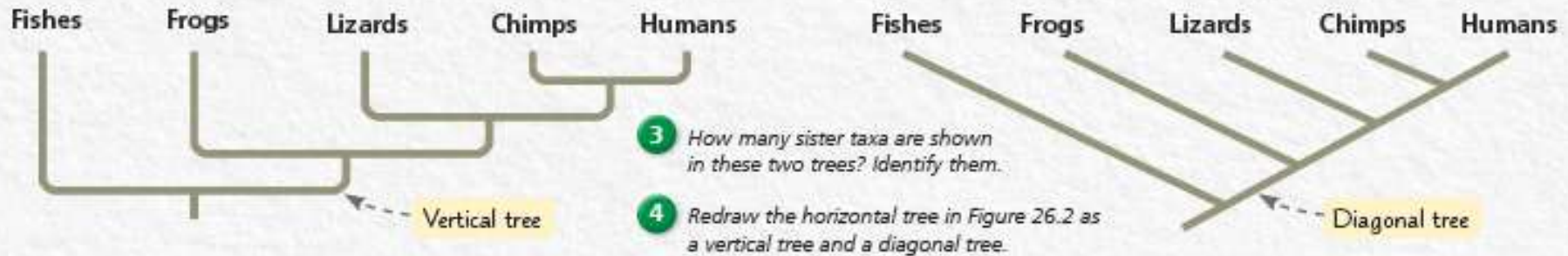
Each position along a branch represents an ancestor in the lineage leading to the taxon named at the tip.

Sister taxa are groups of organisms that share a common ancestor that is not shared by any other group. Chimps and humans are an example of sister taxa in this tree.

- 1 According to this tree, which group or groups of organisms are most closely related to frogs?
- 2 Label the part of the diagram that represents the most recent common ancestor of frogs and humans.

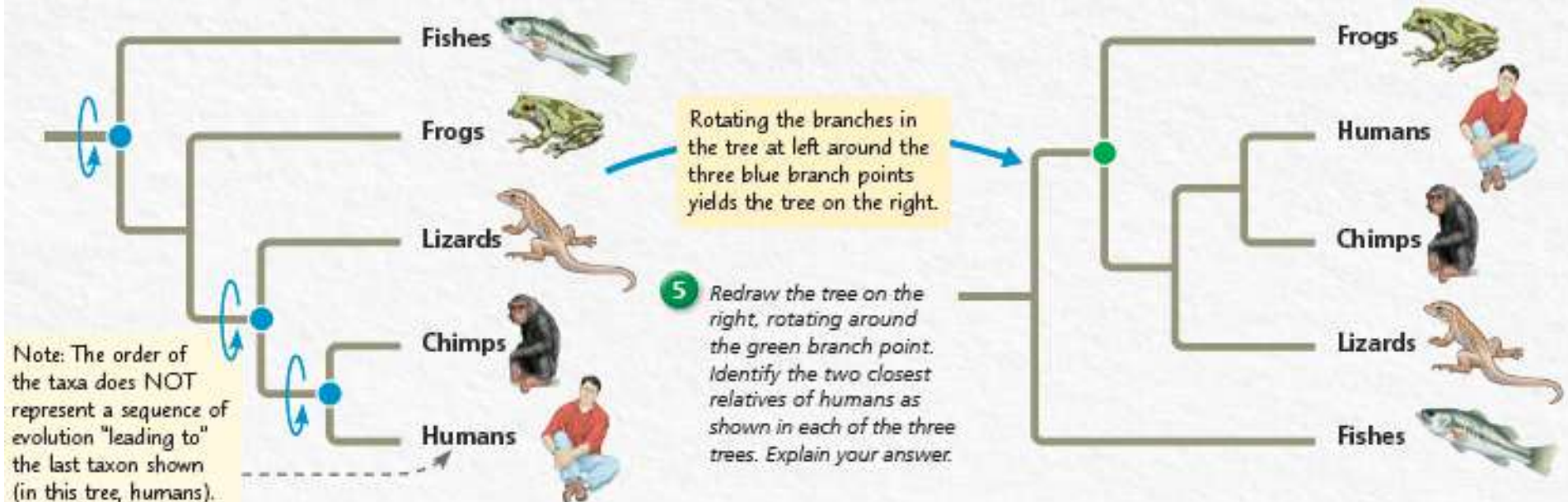
Alternative Forms of Tree Diagrams

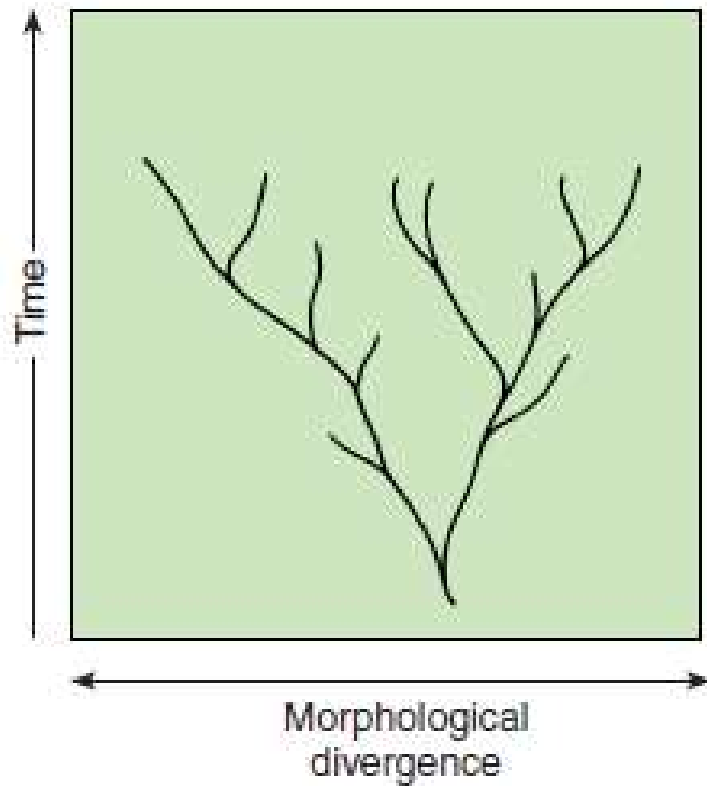
These diagrams are referred to as "trees" because they use the visual analogy of branches to represent evolutionary lineages diverging over time. In this text, trees are usually drawn horizontally, as shown above, but the same tree can be drawn vertically or diagonally without changing the relationships it conveys.



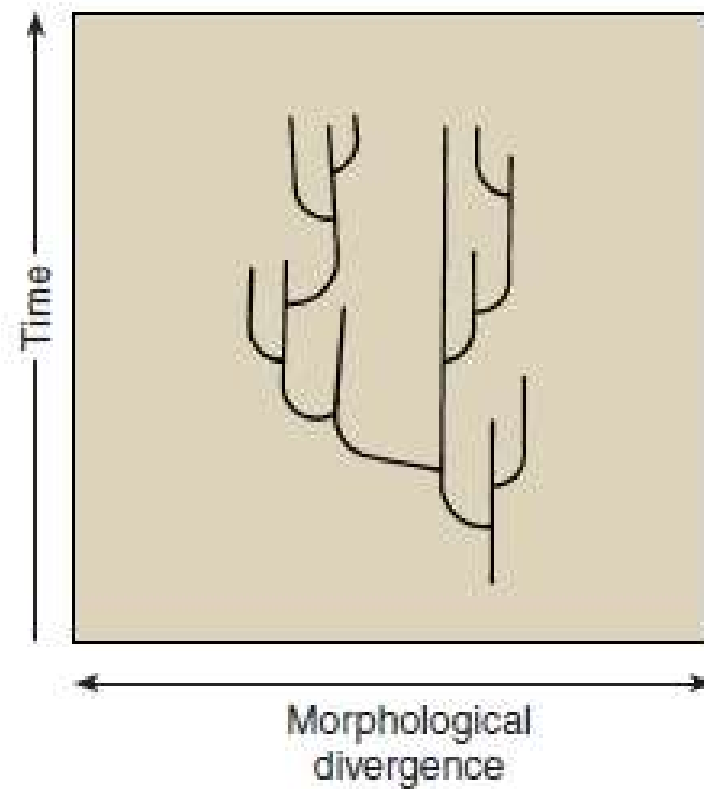
Rotating Around Branch Points

Rotating the branches of a tree around a branch point does not change what they convey about evolutionary relationships. As a result, the order in which taxa appear at the branch tips is not significant. What matters is the branching pattern, which signifies the order in which the lineages have diverged from common ancestors.

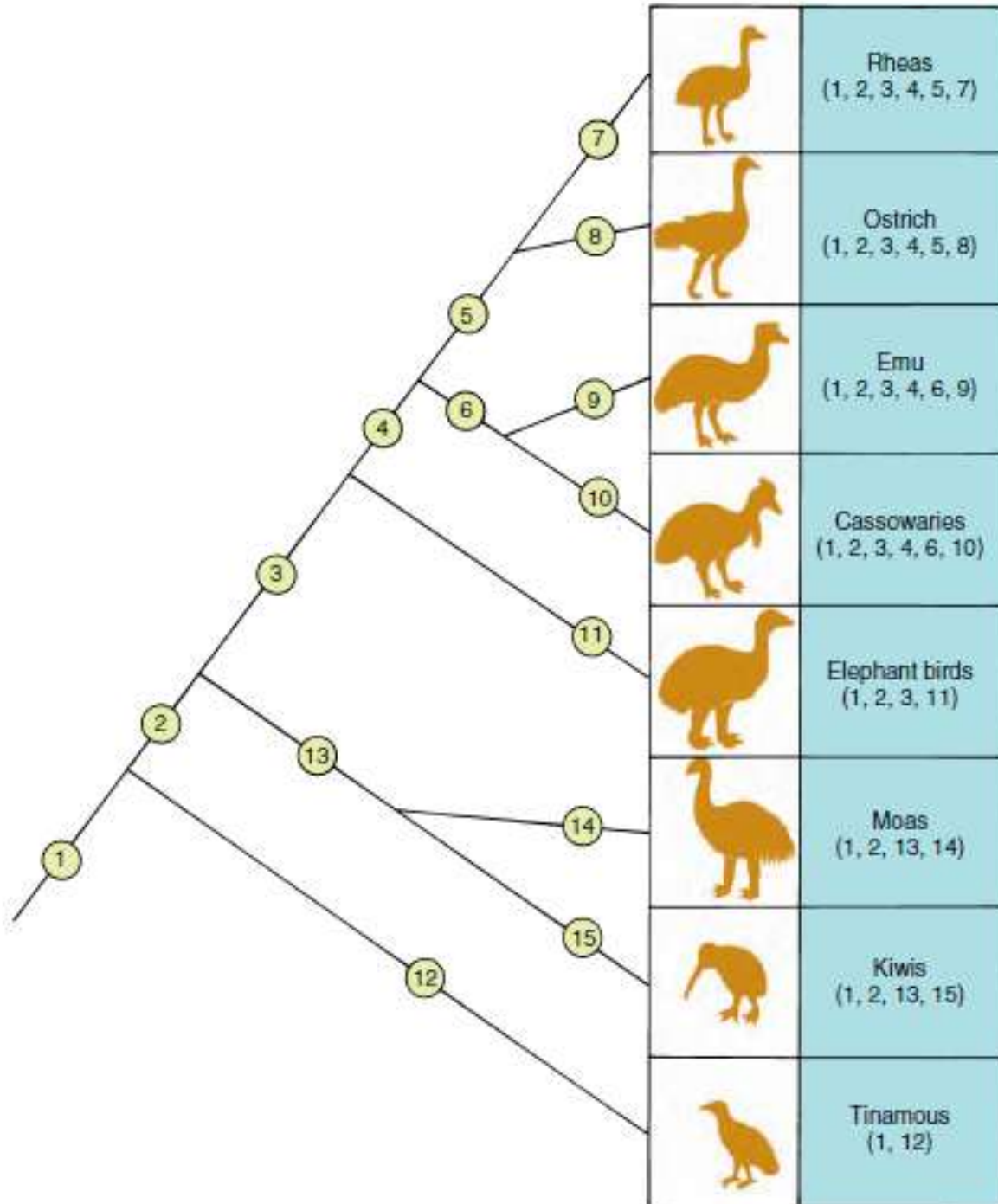




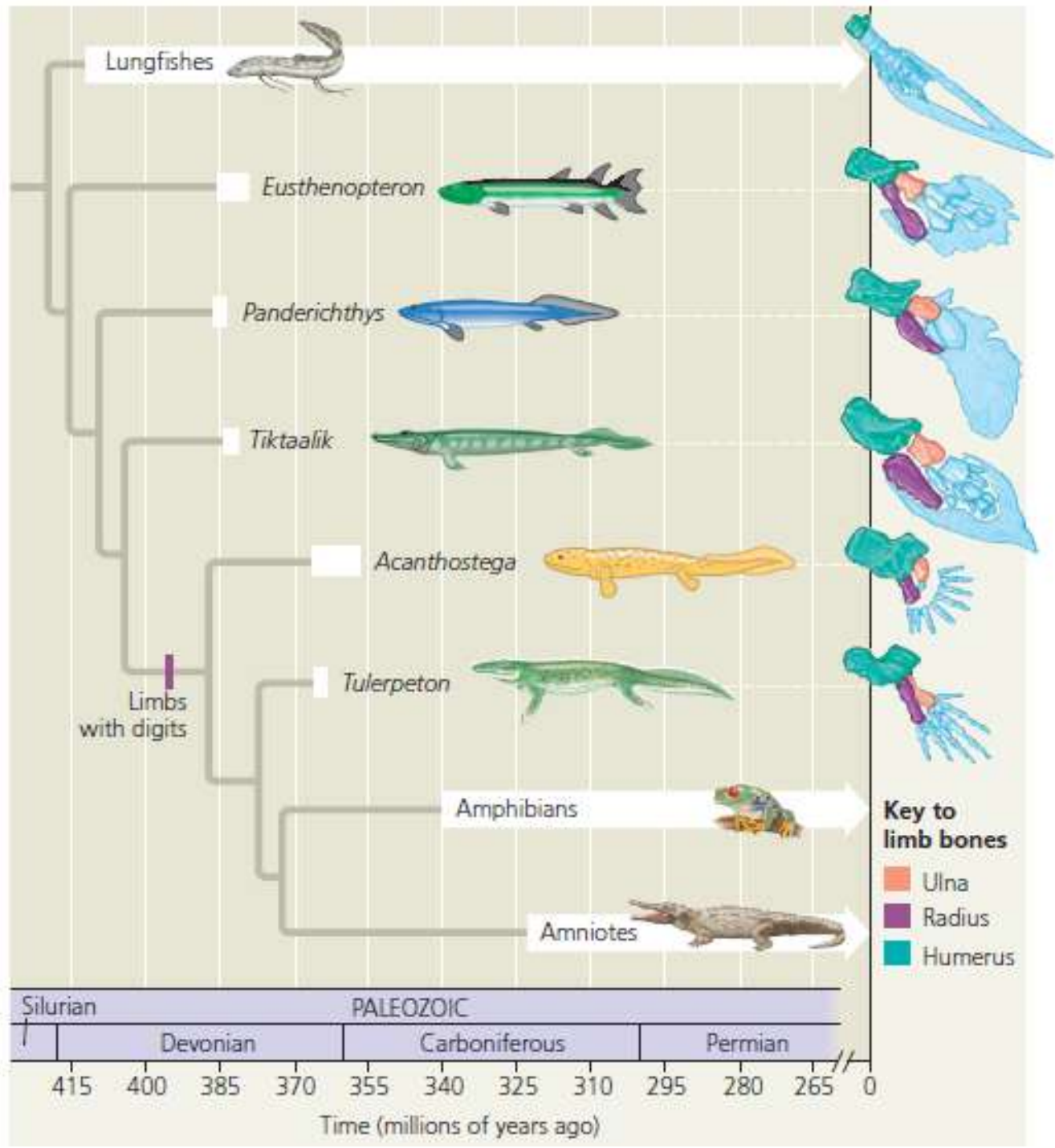
The gradualist model of evolutionary change in morphology, viewed as proceeding more or less steadily through geological time (millions of years). Bifurcations followed by gradual divergence led to speciation.

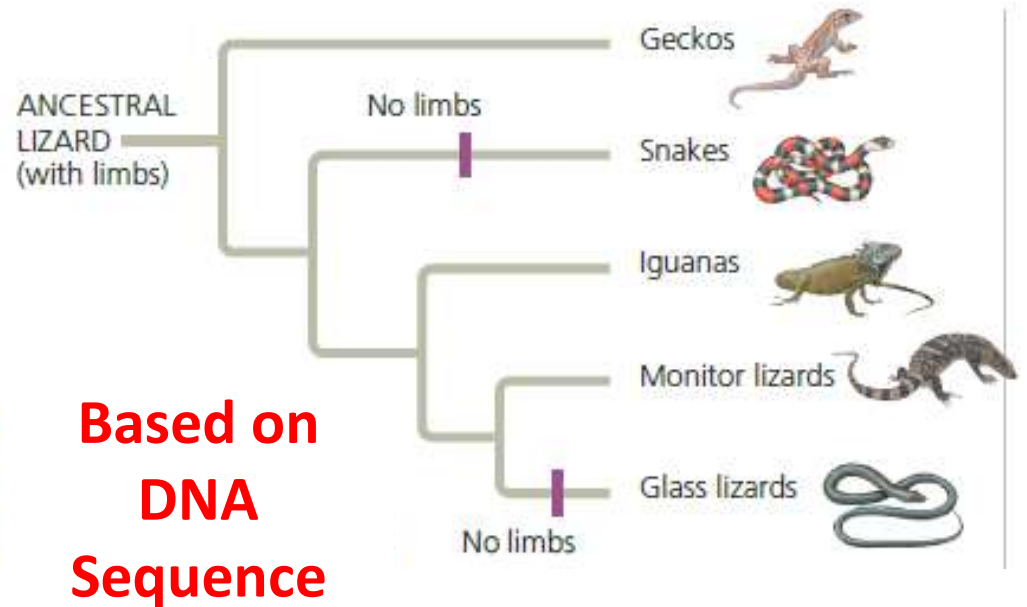
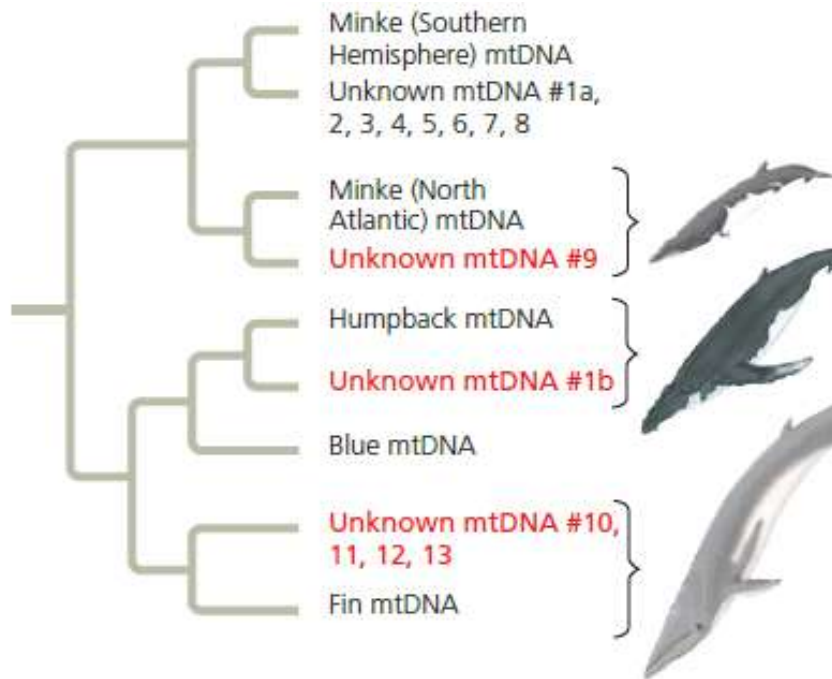
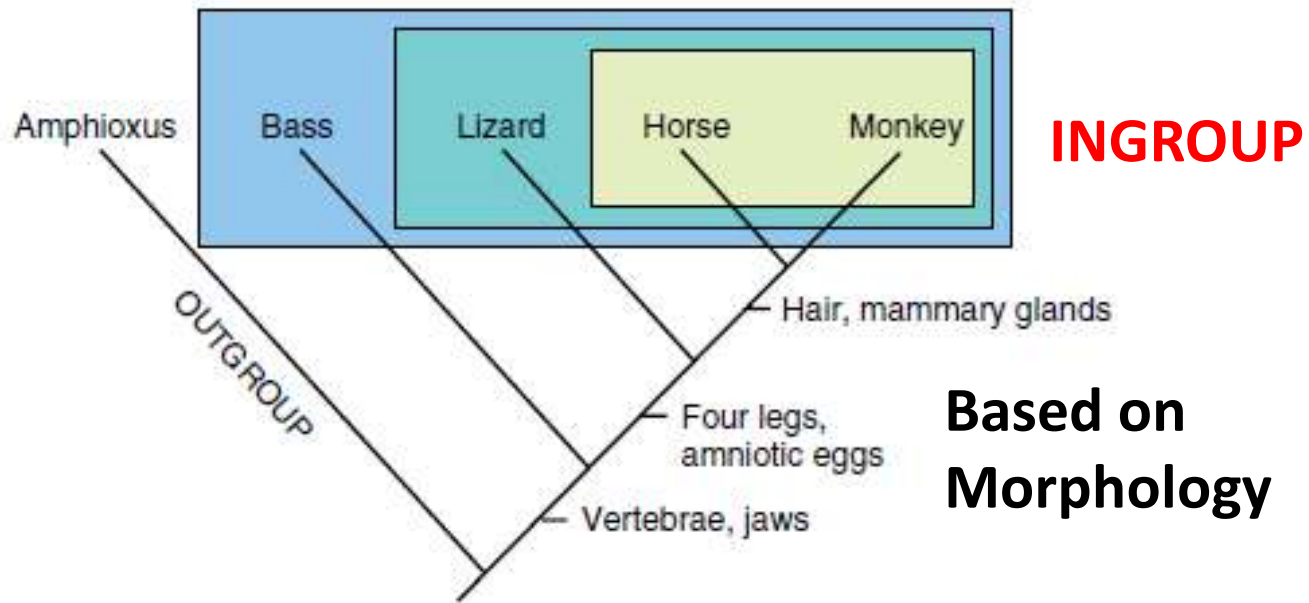


The punctuated equilibrium model sees evolutionary change being concentrated in relatively rapid bursts of branching speciation (lateral lines) followed by prolonged periods of no change throughout geological time (millions of years).



Shared Derived Character



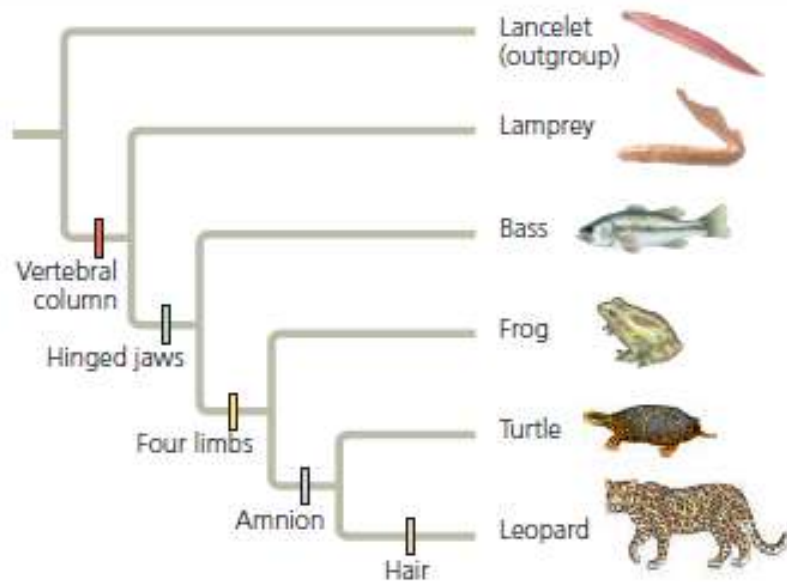


Bagaimana Cara Membuat Pohon Filogenik/ Kladogram??



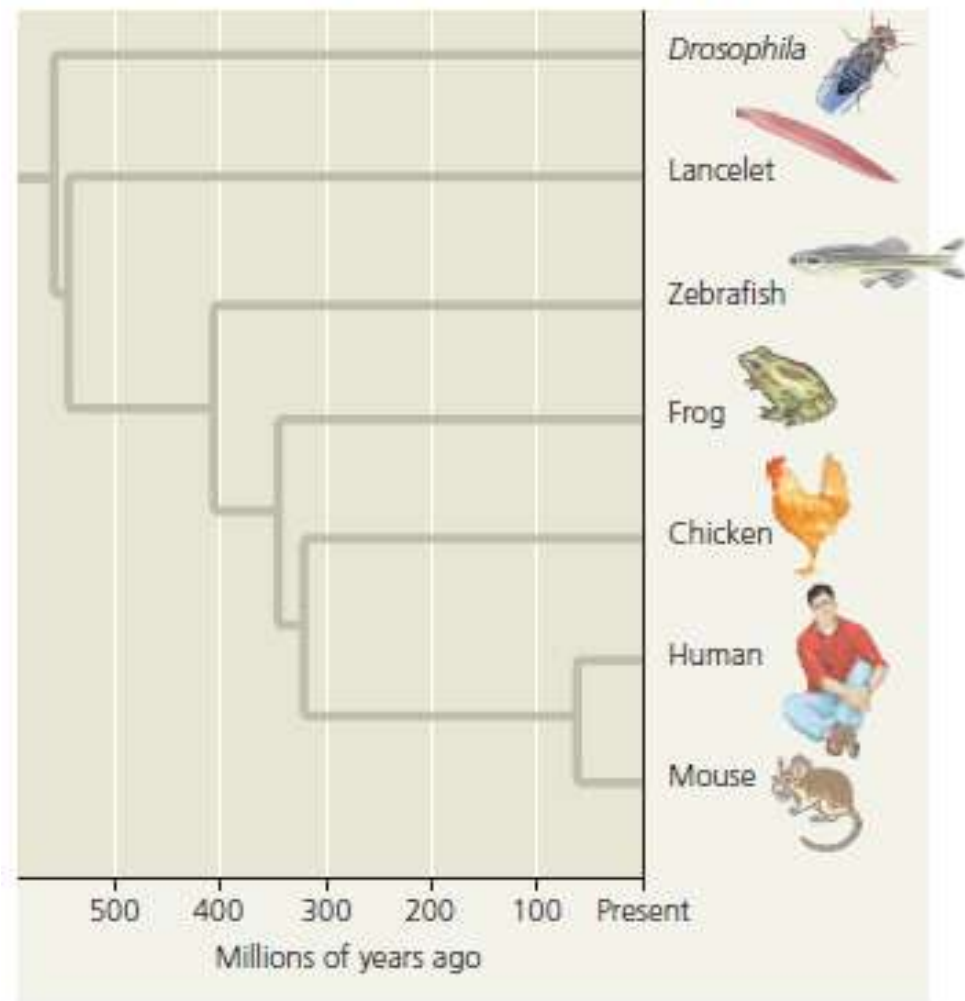
CHARACTERS	TAXA					
	Lancelet (outgroup)	Lamprey	Bass	Frog	Turtle	Leopard
Vertebral column (backbone)	0	1	1	1	1	1
Hinged jaws	0	0	1	1	1	1
Four limbs	0	0	0	1	1	1
Amnion	0	0	0	0	1	1
Hair	0	0	0	0	0	1

(a) **Character table.** A 0 indicates that a character is absent; a 1 indicates that a character is present.

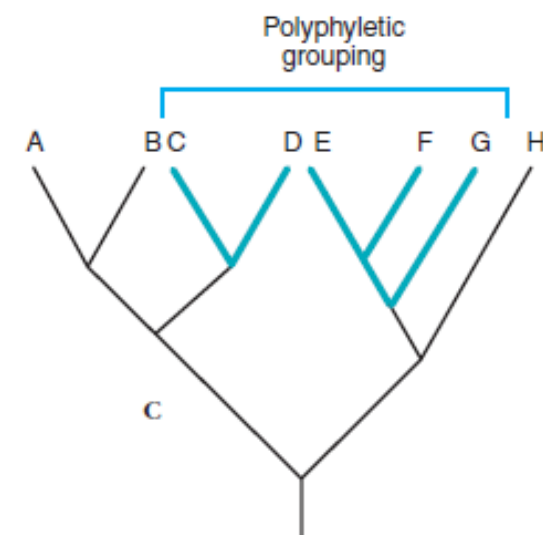
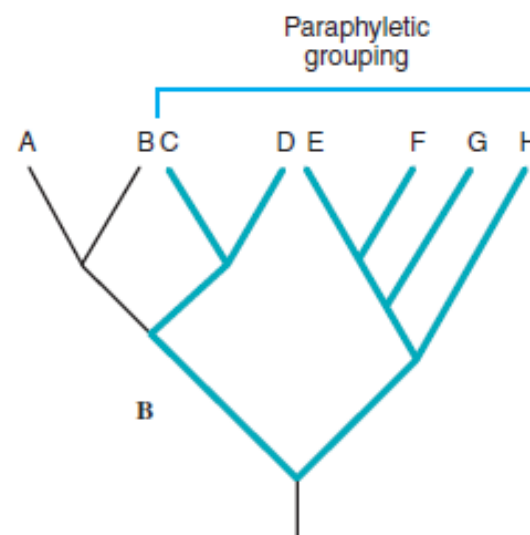
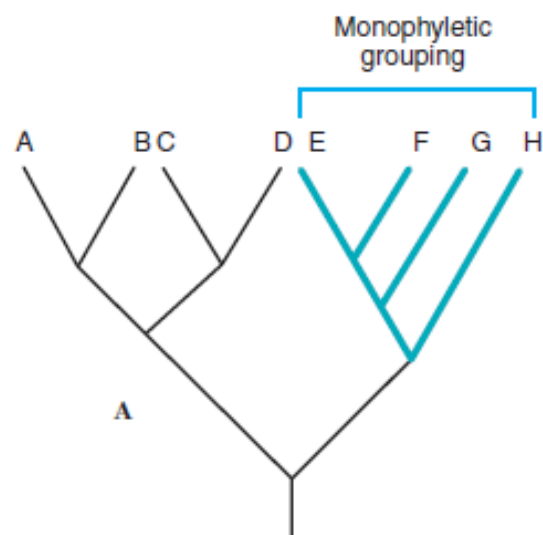
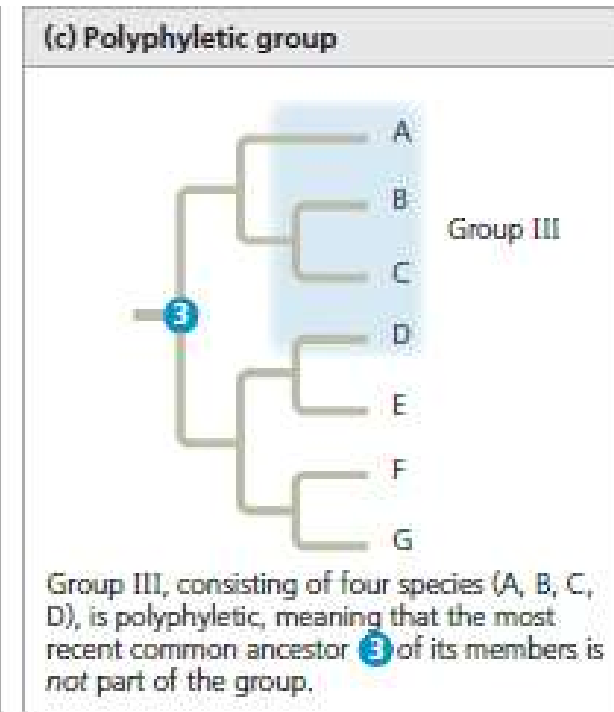
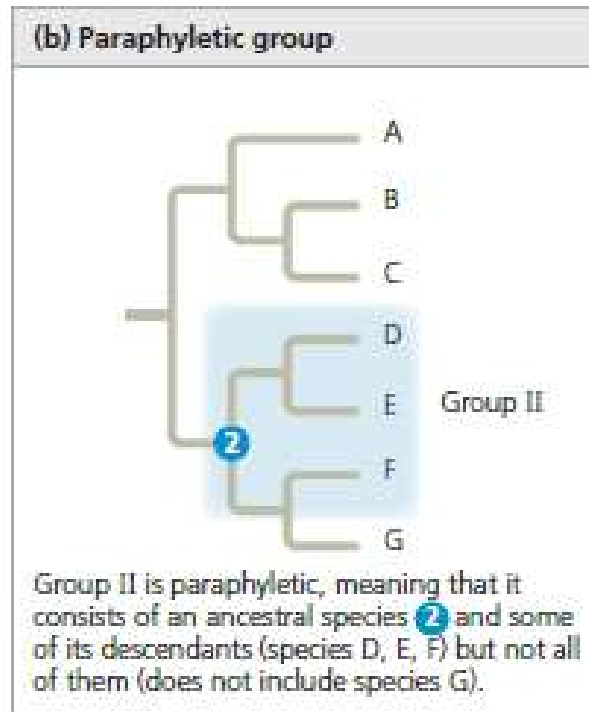
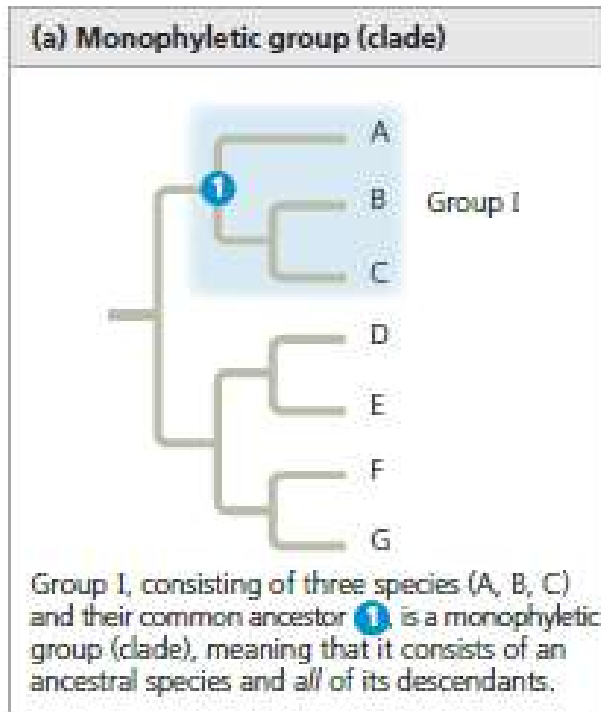


(b) **Phylogenetic tree.** The character table in (a) leads us to infer the phylogenetic relationships shown in this tree.

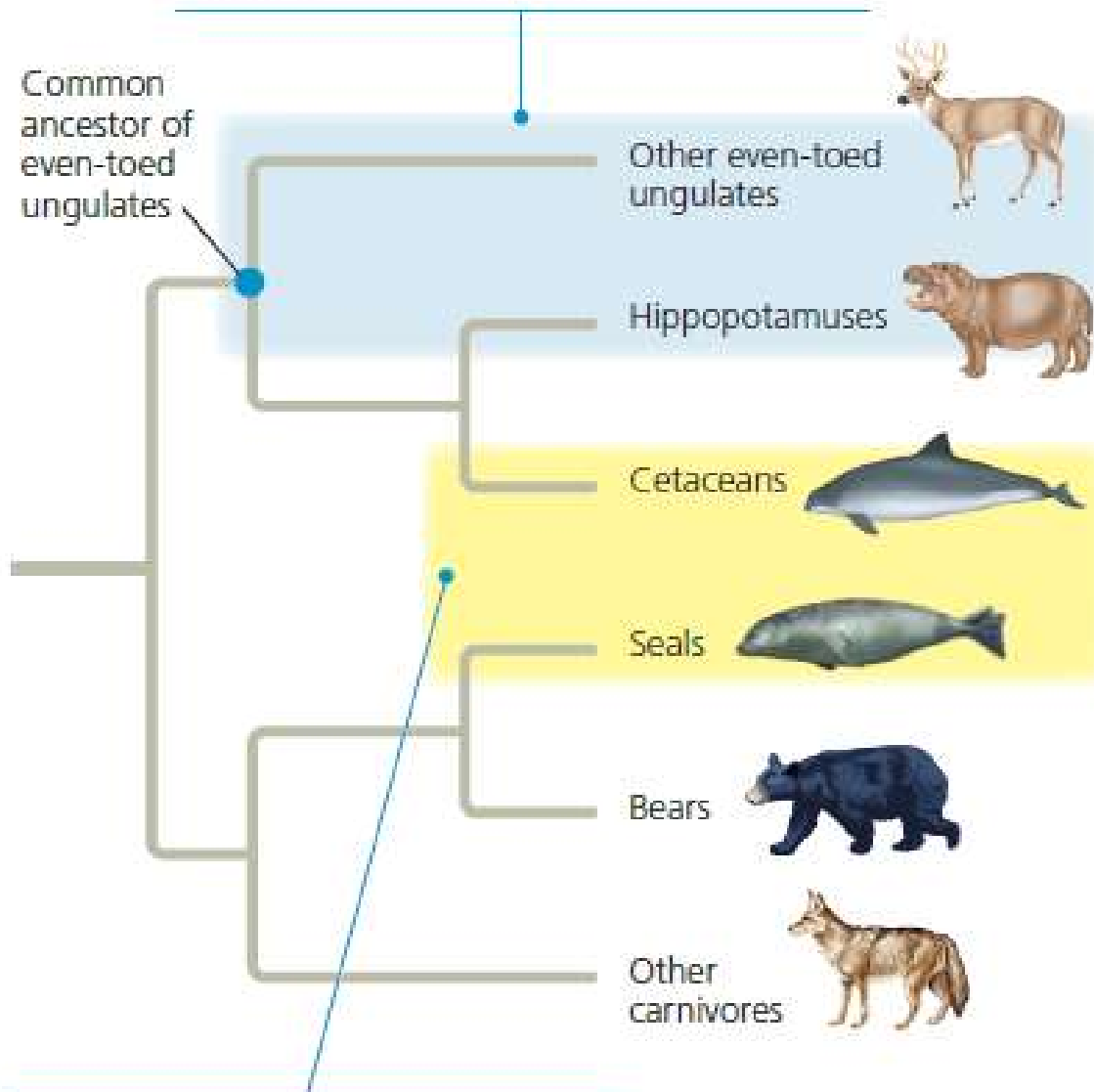
▼ **Figure 26.14 Branch lengths can indicate time.** This tree is based on the same DNA data as that in Figure 26.13, but here the branch points are dated based on fossil evidence. Thus, the branch lengths are proportional to time. Each lineage has the same total length from the base of the tree to the branch tip, indicating that all the lineages have diverged from the common ancestor for equal amounts of time.



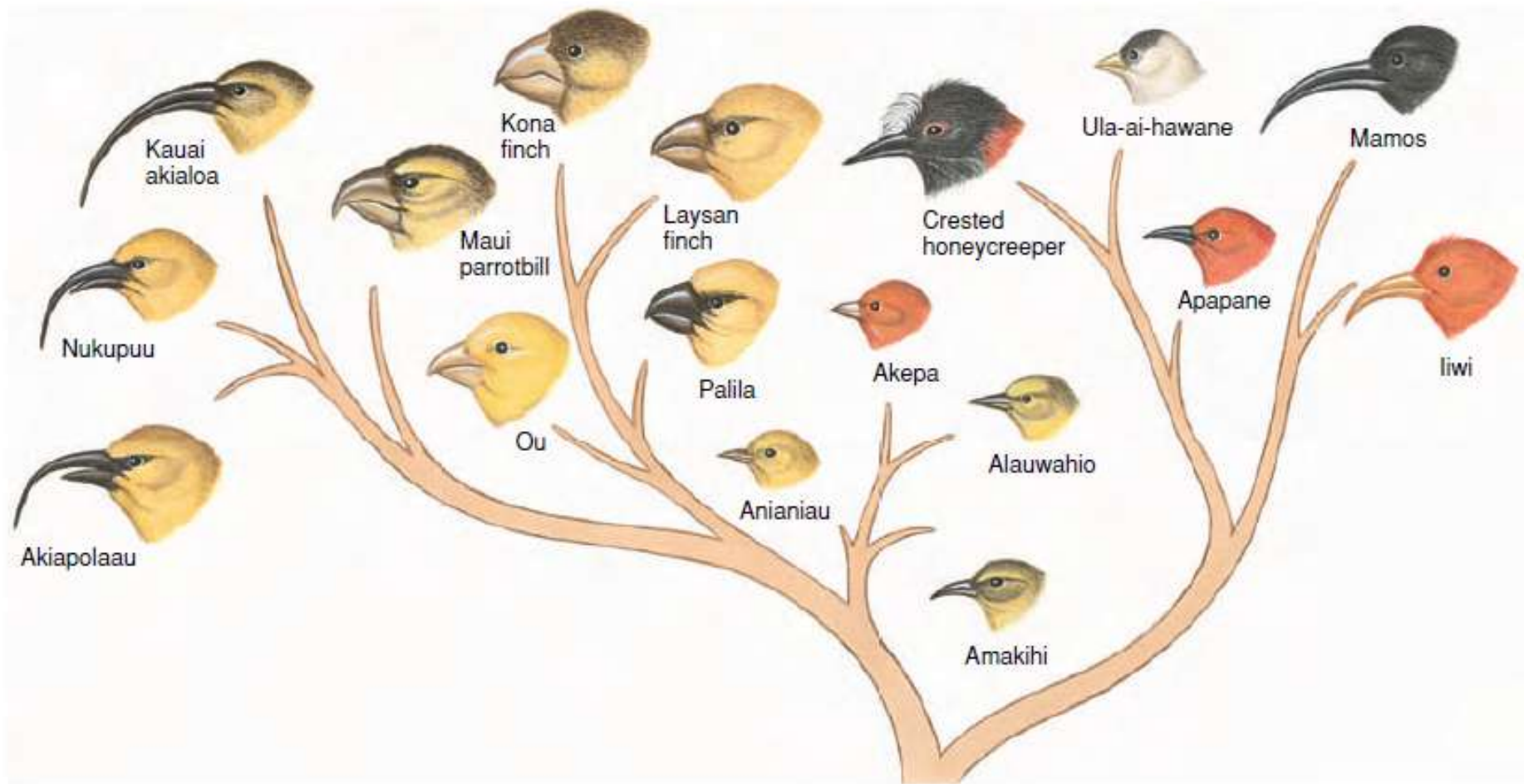
MONOFILI, PARAFILI DAN POLIFILI



This group is paraphyletic because it does not include all the descendants of the common ancestor (it excludes cetaceans).



This group is polyphyletic because it does not include the most recent common ancestor of its members.



Mana yang **MONO**, **PARA** dan **POLIFILETIK**??



SOFT SKILL

*“Manusia adalah makhluk paling kompleks
Berada pd tingkat Hierarki yg tinggi tp bukan berarti
bisa semena-mena thdp makhluk ditingkat lebih
rendah”*

TUGAS

- **Buat Makalah per Kelompok**
- **Format mengikuti artikel ilmiah**
- **Tidak boleh Copy Paste**
- **Referensi harus jelas**

Tema: ZOOGEOGRAFI

Permukaan Bumi Mulai 600 Juta tahun yang lalu
sampai sekarang (Era/ Masa)

Mencakup:

- Era/ Masa
- Bagaimana keadaan bumi
- Hewan apa saja yang ada (hewan apa saja yang muncul dan punah)