جامعة بيرزيت

BIRZEIT UNIVERSITY

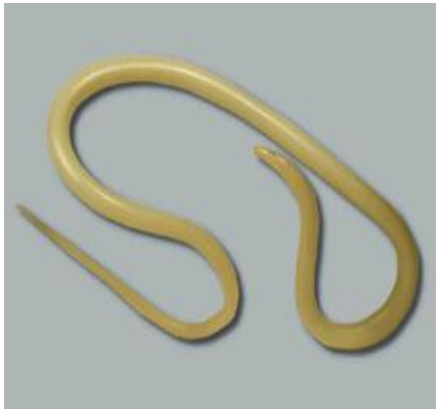
Dept. Biology & Biochemistry

Invertebrate Zoology (Biol 242)

Prof. Dr. KM Swaileh

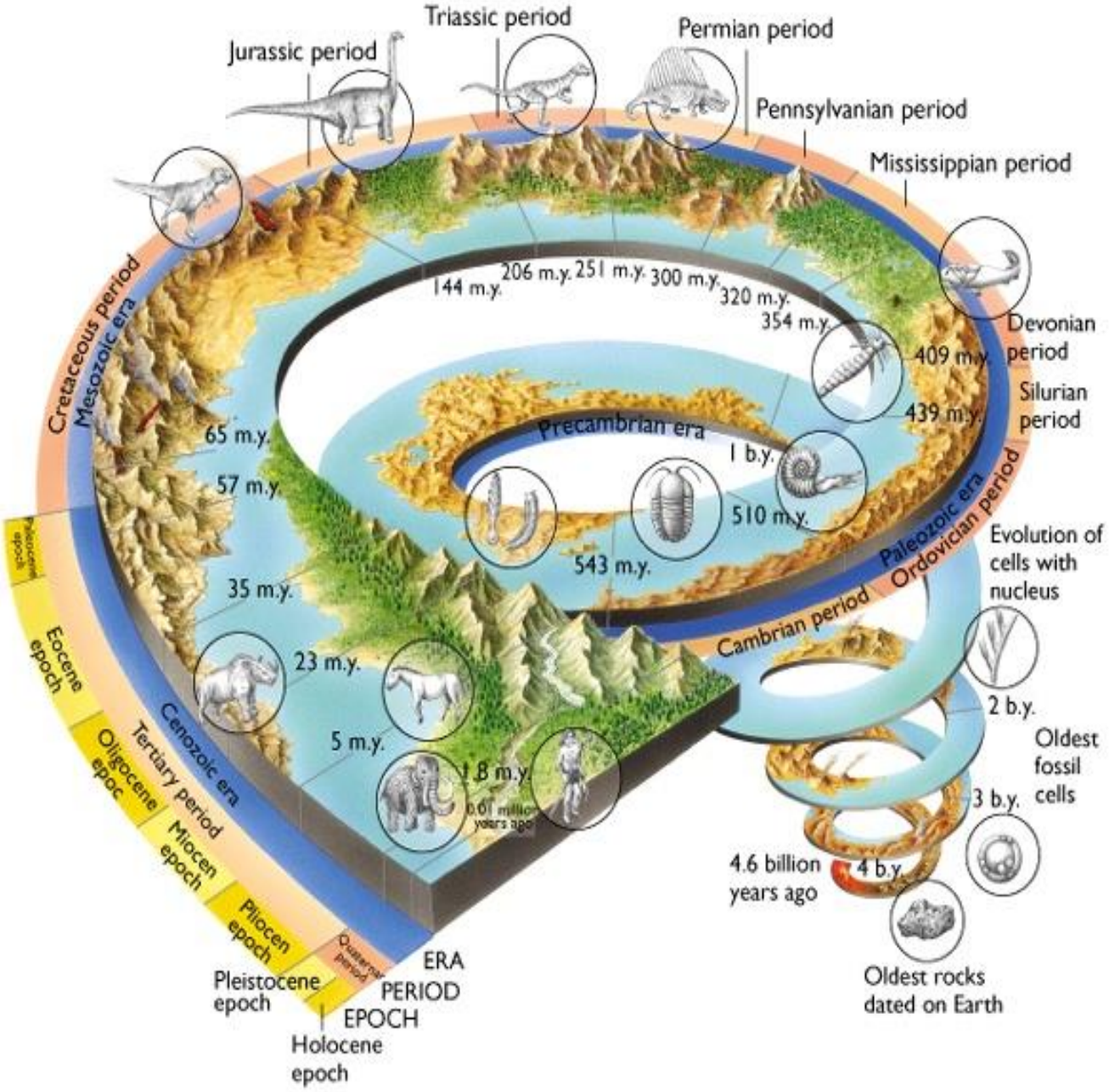
Chapters 1 & 2

Introduction



The Invertebrates: an Introduction

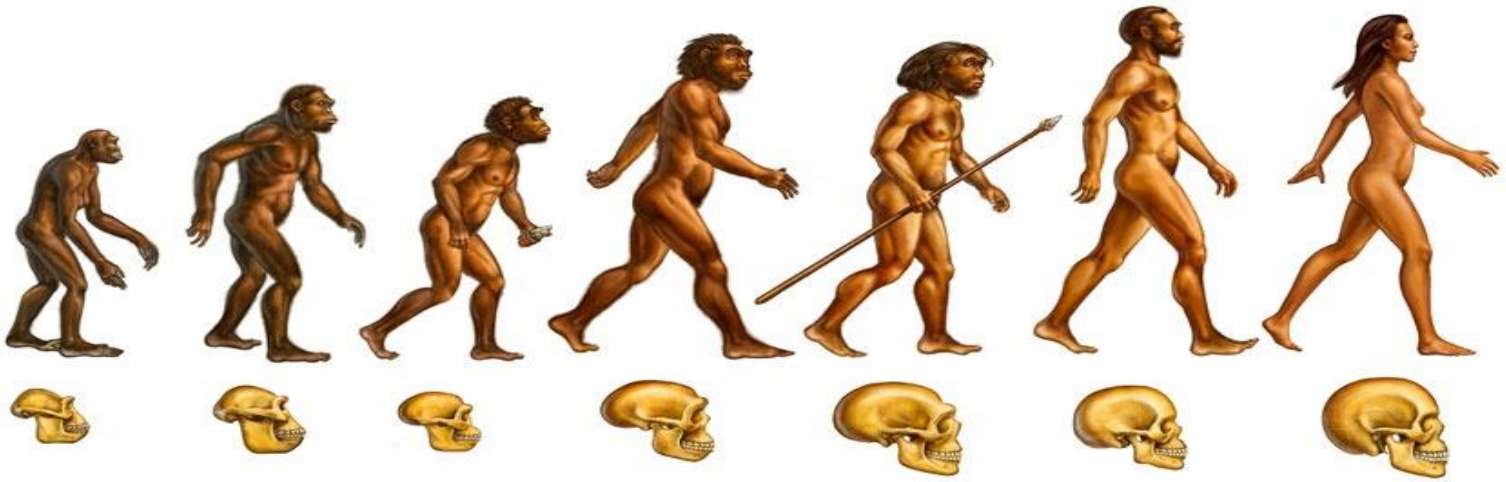
- **Life on Earth:**
  - Life on Earth has **evolved gradually**: from **no organisms** to **over 1.7 million** described species.
  - Scientists estimate that another **4-10 million species** await discovery.


Jurassic period
Triassic period
Permian period
Pennsylvanian period
Mississippian period
Devonian period
Silurian period
Ordovician period
Cambrian period
Precambrian era
Paleozoic era
Mesozoic era
Cretaceous period
Cenozoic era
Tertiary period
Eocene epoch
Oligocene epoch
Miocen epoch
Pliocen epoch
Pleistocene epoch
Holocene epoch
Quaternar period
ERA
PERIOD
EPOCH
144 m.y.
206 m.y.
251 m.y.
300 m.y.
320 m.y.
354 m.y.
409 m.y.
439 m.y.
510 m.y.
543 m.y.
1 b.y.
2 b.y.
3 b.y.
4 b.y.
4.6 billion years ago
65 m.y.
57 m.y.
35 m.y.
23 m.y.
5 m.y.
1.8 m.y.
0.01 million years ago
Evolution of cells with nucleus
Oldest fossil cells
Oldest rocks dated on Earth

- The Earth itself is about 4.6 billion yrs old.
- The oldest fossils of prokaryotes are 3.6 billion yrs old.
- The oldest fossils of eukaryotic cells are 1.5 billion yrs old.
- Multicellular life evolved some 650 million yrs ago.

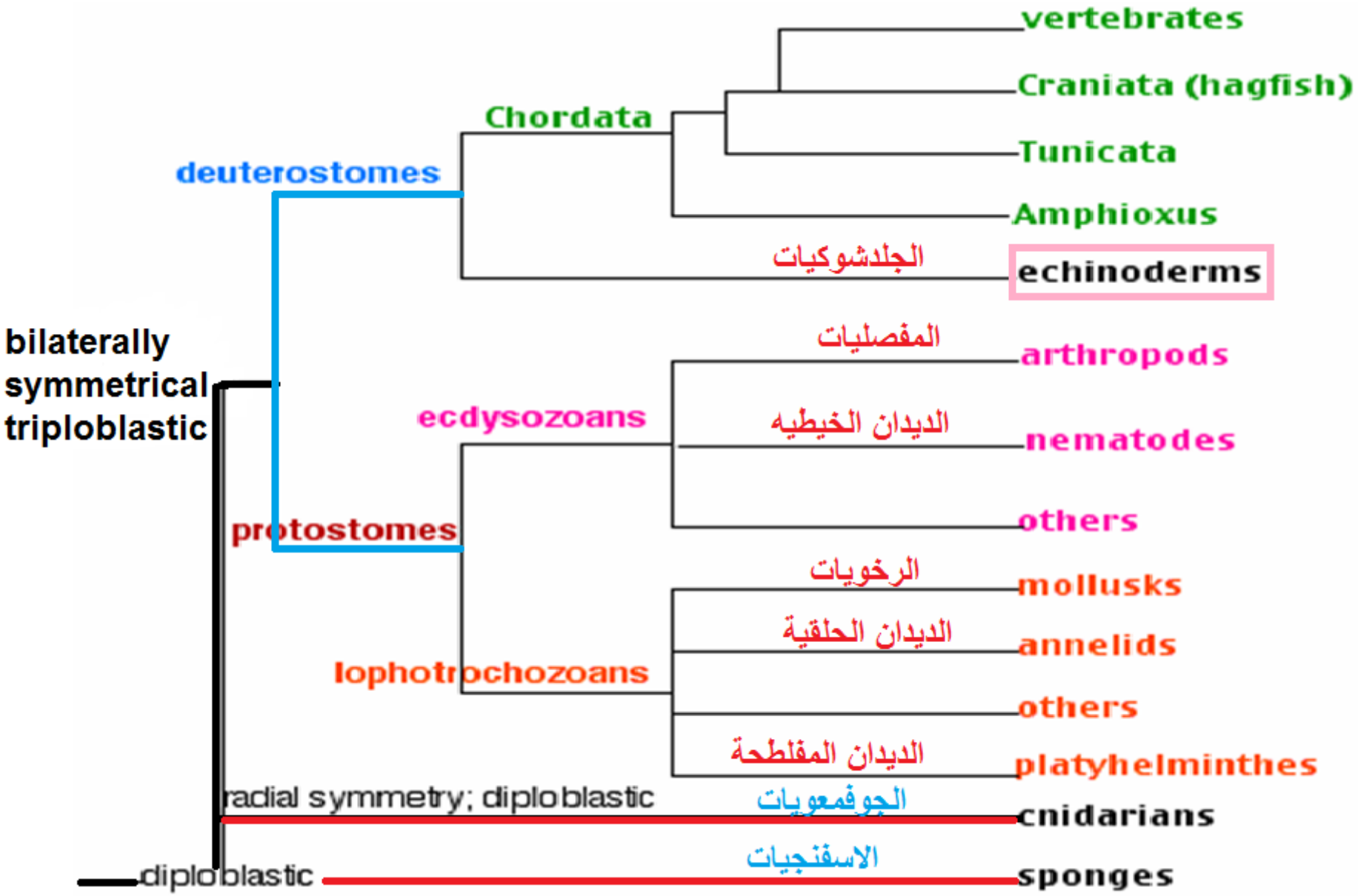
Human Evolution:

- *Hominids* "Human ancestors": evolved some 3 million yrs ago.
- *Homo sapiens*: evolved between 400,000 yrs and 250,000 yrs ago.
- *Homo sapiens sapiens*: 200,000 yrs-present.



The Origin and Evolution of Animals:

- We do not yet know from what group(s?) of eukaryotes the animals evolved.
- This evolution occurred in **Precambrian** times.
- A rapid diversification of complex animals took place during the **Cambrian (540 myrsa)** and was called the **Cambrian Explosion**.
- Our best guesses are shown in the figure (**cladogram**) below:

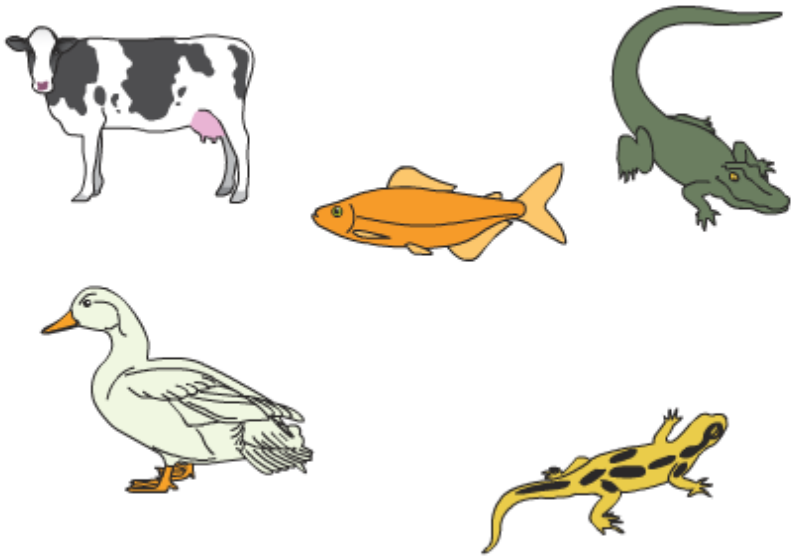

vertebrates
Craniata (hagfish)
Chordata
Tunicata
deuterostomes
Amphioxus
الجلدشوكيات
echinoderms
bilaterally
symmetrical
triploblastic
المفصليات
arthropods
ecdysozoans
الديدان الخيطيه
nematodes
others
protostomes
الرخويات
mollusks
الديدان الحلقية
annelids
lophotrochozoans
others
الديدان المفلطحة
platyhelminthes
radial symmetry; diploblastic
الجوفمعويات
cnidarians
الاسفنجيات
diploblastic
sponges

- **Protostomes** ("first mouth").
- **Deuterostomes** ("second mouth").
- **Lophotrochozoans**: animal groups having genomic similarities: Annelida, Mollusca, and Platyhelminthes.
- **Ecdysozoans: molting animals**: shedding their skin or exoskeleton; **Lack cilia.**

  Includes: nematodes and arthropods.

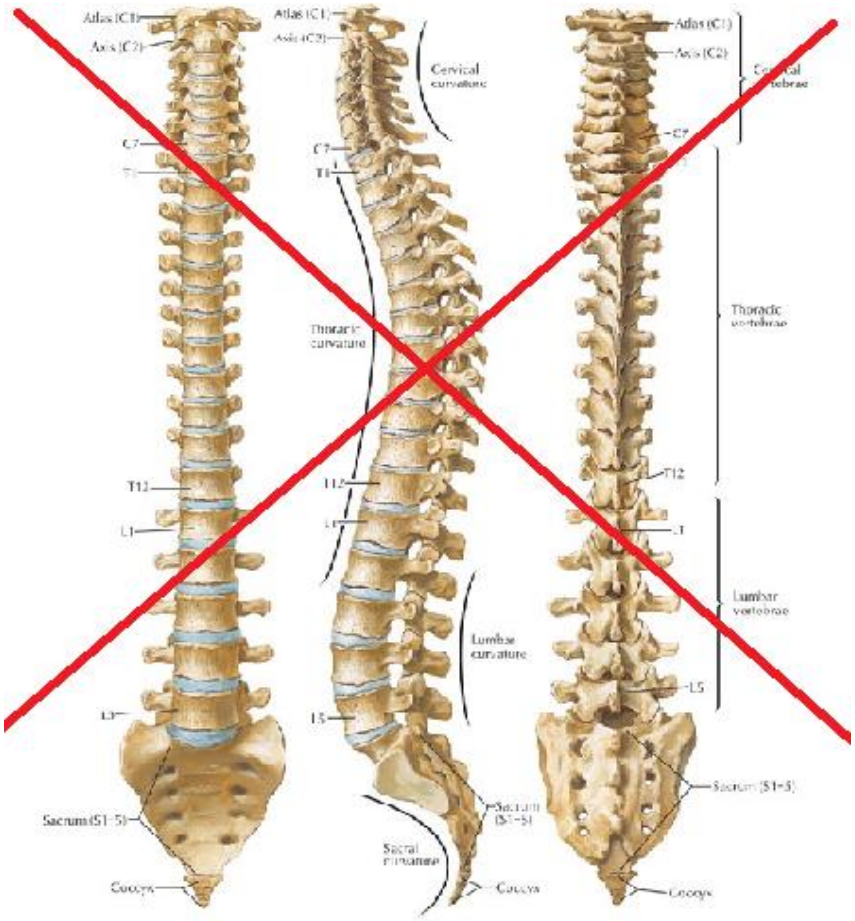
The animals:

- Divided into **2 groups**:

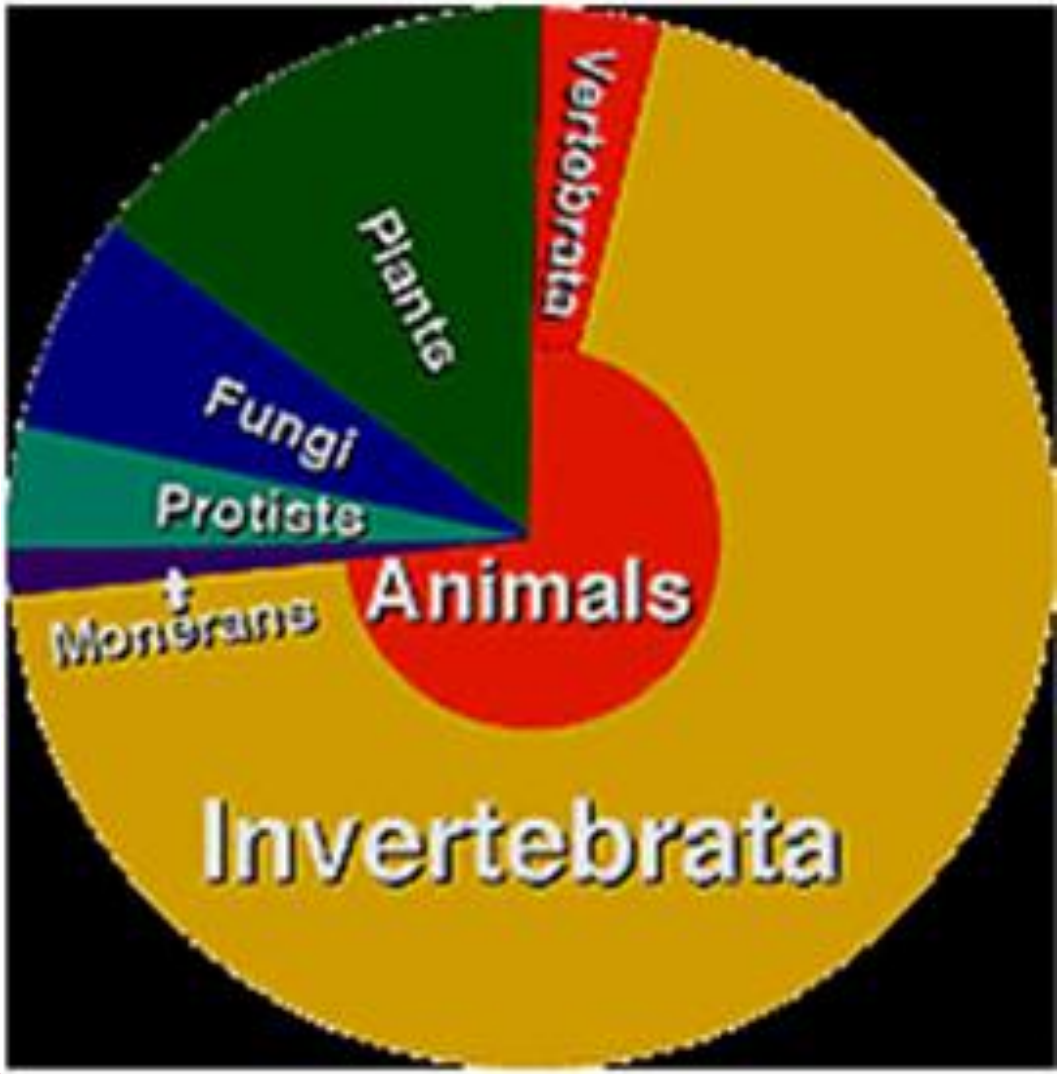
vertebrates with backbones	invertebrates
	
2%	**98%**

The Invertebrates

(Animals without backbones)



- **Invertebrates**: the dominant group (about 78%) of organisms on Earth.



- Invertebrates **lack bony internal skeletons**.
- Instead, many invertebrates have a **hard outer shell**, like insects and crustaceans.
- Others have a fluid-filled, **hydrostatic skeleton**, like the jelly fish or worms.
- Invertebrates are **found in all habitats** on Earth except the deep sea.
- The number of **known invertebrate species exceeds 1 million**.

importance of Invertebrates

- Simply, life on Earth without invertebrates is almost **IMPOSSIBLE**.
- This is because invertebrates are important for the **function of ecosystems** on Earth.
- Invertebrates are the **main pollinators** on earth; they participate in the **recycling of organic matter**; **food for other organisms**….).

Size range of Invertebrates

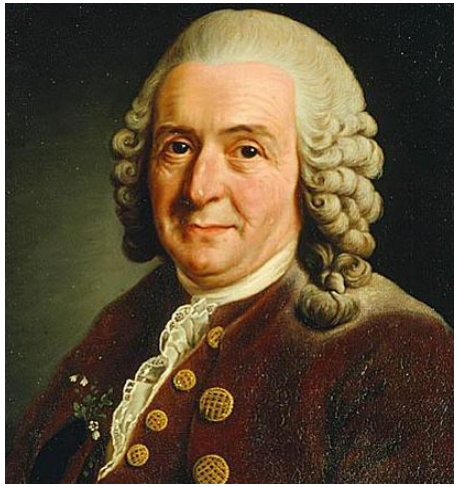
- Not all invertebrates are small in size. Some Invertebrates can be huge in size: example: the **Giant Squid can reach 18m long** and **weigh about 1000kg**.
- Others are **microscopic,** like the **Gall mites**, which are **less than 0.25mm long.**

- Giant Squid

Gall Mites

Classification of Organisms

- Because of the **large number** and **diversity of animals**, **scientists classified similar animals into certain groups.**
- This makes studying these animals easier.
- **CAROLUS LINNAEUS**: A Swedish scientist who lived in the 18th century.
- He **classified plants and animals** according to **their evolutionary relationships in 1758**.



- Divided living things into **one of two "kingdoms":**
  - **Kingdom plantae**
  - **Kingdom animalia**
- Then he divided each of the kingdoms into smaller groups called "**genera**" (plural of "genus").
- Thereafter he divided each genus into smaller groups called "**species**".

- Linnaeus designed a **system of naming organisms** called **binomial ("two names") nomenclature** which gave **each organism 2 names** **known as the scientific name of the organism.**
  - The two names that that he used to constitute the scientific name are the **Genus** and **species** names.
  - His system is still used today but with some modifications.

- **How to write scientific names?**
- Scientific names **MUST** be written according to certain rules that include:
  - **RULE 1**: The **Genus** name always **starts with a capital letter** the **species with a small one.**
  - **Example:** ***Taenia saginata***

- **RULE 2**: the scientific name must be **Differentiated** from other text.
  - This can be done in **many ways**: underline, *italic*, **bold**, color, …….etc. **Examples:**
  - Taenia saginata is the beef tapeworm.
  - *Taenia saginata* is the beef tapeworm.
  - **Taenia saginata** is the beef tapeworm.
  - Taenia saginata is the beef tapeworm.

- **Additional things about scientific names:**
  - Scientific names may be followed by the name of the scientist who suggested the name and in which year. **Example**:

Passer domesticus (Linnaeus, 1758).

- Sometimes a **third name** (**subspecies**) follows the genus and species names.
  - Example: The head louse:

Pediculus humanus capitis

The body louse:

Pediculus humanus corporis